

AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

Vol. 66

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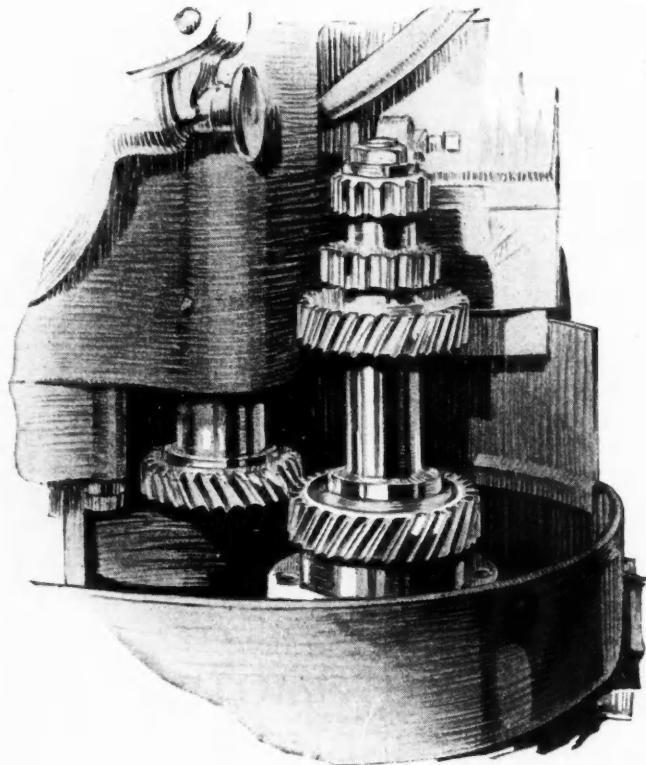
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March 26, 1932

Automotive Industries

American Rubber-Pile at End of 1931 Big Enough to Carry-On 13 Months

by Harry Symington
Symington & Wilson, London

Raw rubber continues to be sold from overseas below cost of production, and accumulation of U. S. stocks will probably continue as long as this condition exists



LAST year we drew attention to the difficulties of the rubber producers who were faced with a steady accumulation of surplus stocks and a falling price. This year the process has continued unabated. We estimated that the addition to surplus stocks during 1930 was at the rate of about 11,500 tons per month and the rate of increase has been only very little lower during 1931.

Throughout the year 1931 there have been constant rumors of government action to restrict export or output. Up to the time of writing no decision has yet been arrived at, or at any rate, none has been made public.

It has, meantime, become very evident that without government assistance nothing can be done to call a halt in the output of large quantities of rubber in excess of world requirements. The published outputs of the various producing companies and their estimates for future production amply demonstrate the determination of individual producers and groups of producers to pursue a policy of high production in order to obtain a low cost per pound. Numerous companies have managed during the past year to introduce economies in many directions and by producing large crops have reduced their costs to levels which had not previously been thought possible.

This, however, has only been done by the production of large monthly additions to the world's rubber surplus, and the actual effect may, without exaggeration, be said to have been that for every farthing reduction in costs sufficient rubber has been produced to force the selling price down by at least double that amount.

A few producing companies are now able to show costs of about 3d. per lb., and in some cases even slightly less than that figure. From an examination of the more recently published results of a large number of companies we find that the average all in cost

of plantation rubber may be taken as 4½d. per lb. This figure, of course, includes nothing for reserves or for any dividend on the capital invested. With a selling price under 3d. per lb. the producing companies taken as one body are faced with a minimum average loss of 1½d. per lb. or £14 per ton.

There is one highly important difference in the stock accumulations in 1931 as against those of 1930, namely, that in 1931 the bulk of the increase in stock has taken place in the U.S.A. Stocks in the United Kingdom increased from 118,515 tons at end of 1930 to 127,103 tons at end of 1931, an increase in round figures of only 8600 tons against increases of 45,250 tons in 1930 and 50,600 tons in 1929. On the other hand, stocks in the U.S.A. and afloat thereto at end of 1930 were 258,281 tons and had increased by end of December, 1931, to 376,765 tons, a total increase of 118,500 tons, equal to practically 10,000 tons per month. The total stock on hand in the U.S.A. and afloat thereto at end of December, 1931, exceeded America's total consumption during the year by 27,800 tons. American buyers fully realize that no article can be sold below the cost of production for an indefinite period and will probably continue to accumulate supplies so long as this condition continues.

A table showing the American consumption month by month with the consumption per working day for comparison follows:

| | 1930 | | 1931 | |
|-----------------|---------------|----------------------------|---------------|----------------------------|
| | Total Tons | Per working day Tons | Total Tons | Per working day Tons |
| January . . . | 36,669 | 1,410 | 28,557 | 1,098 |
| February . . . | 32,726 | 1,487 | 28,797 | 1,309 |
| March . . . | 35,914 | 1,381 | 32,788 | 1,261 |
| April . . . | 40,207 | 1,546 | 33,321 | 1,281 |
| May . . . | 39,902 | 1,535 | 37,817 | 1,513 |
| June . . . | 34,643 | 1,386 | 37,917 | 1,458 |
| July . . . | 29,894 | 1,196 | 31,937 | 1,228 |
| August . . . | 30,575 | 1,176 | 27,586 | 1,061 |
| September . . . | 25,288 | 1,011 | 23,638 | 945 |
| October . . . | 27,271 | 1,049 | 22,277 | 857 |
| November . . . | 23,480 | 1,021 | 22,943 | 997 |
| December . . . | 21,493 | 827 | 21,408 | 823 |
| Total | 378,062 | | Total | 348,986 |

In view of the poor state of trade in America the falling off in consumption of raw rubber has been less than might have been expected. The drop in the production of passenger cars and trucks amounts to 29 per cent against rather less than 8 per cent in rubber consumption. Despite the big fall in new motor vehicle output, sales of tires for the year show a drop of only about 6½ per cent. Stocks of tires in manufacturers' hands are again reduced, but are adequate for the existing demand.

Up to a few years ago America's consumption of raw rubber used to account for about 70 per cent of the total consumption of the world. This position is steadily altering, and as will be seen from the subjoined table her proportion has now dropped to 52½ per cent:



| | World Consumption Tons | U.S.A. Consumption Tons | Per Cent |
|------|------------------------------|-------------------------------|----------|
| 1922 | 408,000 | 292,000 | = 71.5 |
| 1923 | 434,000 | 305,500 | = 70.4 |
| 1924 | 475,000 | 335,000 | = 70.5 |
| 1925 | 552,000 | 386,000 | = 70.0 |
| 1926 | 548,000 | 368,000 | = 67.1 |
| 1927 | 581,000 | 371,000 | = 63.9 |
| 1928 | 684,000 | 441,500 | = 64.6 |
| 1929 | 797,000 | 480,500 | = 60.2 |
| 1930 | 676,500 | 378,000 | = 55.9 |
| 1931 | 663,000 | 349,000 | = 52.6 |

The experience of last year makes any estimate of production for the current year more than usually hazardous. When writing on production for 1931 in February of that year we thought it reasonable, in view of the low price then ruling, to estimate for a 10 per cent reduction in output from both Malaya and the Dutch East Indies. Malayan output has fallen not quite 5 per cent, while Dutch East Indies exports show an actual increase of about 6 per cent. Our estimates last year were based on the maintenance of a price in the neighborhood of 4d. per lb. The average price for 1931 was only 3½d., but even this low price did not have the effect of bringing about any material reduction in output.

We have extracted the following from the summary of crop returns of 615 producing companies issued monthly by the Rubber Growers' Association:

| Companies | Jan. 1930 | Jan. 1931 | Jan. 1932 |
|----------------------------|-----------|-----------|-----------|
| | Tons | Tons | Tons |
| British North Borneo . . . | 26 | 523 | 473 |
| Ceylon | 102 | 2,280 | 1,776 |
| India and Burma | 21 | 652 | 397 |
| Malaya | 338 | 14,037 | 13,006 |
| Java | 60 | 2,999 | 3,020 |
| Sumatra | 60 | 4,526 | 4,324 |
| Miscellaneous | 8 | 223 | 225 |
| Total | 615 | 25,240 | 23,221 |
| | | | 24,003 |

These figures do not indicate that price is having any read effect by way of curtailing output. A slight falling off in the first three districts is more than made up for by increases in others. Under these circumstances we are inclined to think, that unless some

Consumption of Rubber 1929-1930-1931

| Consumption | 1929 | 1930 | 1931 |
|-------------------------------|---------|---------|---------|
| | Tons | Tons | Tons |
| United States | 480,000 | 378,000 | 349,000 |
| Canada | 36,500 | 29,500 | 24,500 |
| United Kingdom | 66,500 | 70,000 | 75,000 |
| Germany, etc. | 45,000 | 45,500 | 50,000 |
| France | 60,000 | 55,000 | 47,000 |
| Italy | 15,500 | 18,000 | 10,000 |
| Russia | 17,500 | 17,000 | 32,500 |
| Scandinavia | 5,500 | 6,000 | 4,500 |
| Belgium and Holland | 11,000 | 13,500 | 13,500 |
| Australia | 15,500 | 5,000 | 8,000 |
| Japan | 35,000 | 32,000 | 42,500 |
| Other Countries | 9,000 | 7,000 | 6,500 |
| Total | 797,000 | 676,500 | 663,000 |

Some of the Principal Figures for a Comparison of the Last 3 Years

| | 1929 Tons | 1930 Tons | 1931 Tons |
|--|--------------|--------------|--------------|
| World shipments | 862,500 | 815,000 | 791,500 |
| World consumption | 797,000 | 676,500 | 663,000 |
| Excess of production | 65,500 | 138,500 | 128,500 |
| World consumption | 797,000 | 676,500 | 663,000 |
| Average monthly world's consumption | 66,420 | 56,375 | 55,250 |
| Estimated required stock (equal to 4½ months' consumption) | 298,890 | 253,690 | 248,625 |
| Surplus over requirements | 61,110 | 251,310 | 391,375 |



| | 1929 Tons | 1930 Tons | 1931 Tons |
|---|--------------|--------------|--------------|
| U. S. A. stocks end of year | 105,138 | 202,246 | 322,825 |
| Afloat to U. S. A. | 52,538 | 56,035 | 53,940 |
| Total stock and afloat to U. S. A. | 157,676 | 258,281 | 376,765 |
| U. S. A. consumption for the year | 480,000 | 378,062 | 348,986 |
| Average monthly U. S. A. consumption | 40,000 | 31,500 | 29,100 |
| Stock and afloat equals...months' consumption.. | 4 | 8 | 13 |
| U. S. A. total motor vehicle output | 5,358,420 | 3,354,986 | 2,389,730 |
| U. S. A. tire manufacturers' sales | 69,391,508 | 53,641,384 | 50,060,690 |
| U. S. A. tire manufacturers' stocks, Dec. 31 | 11,837,960 | 9,003,437 | 7,774,720 |
| United Kingdom stock end of year | 73,174 | 118,515 | 127,103 |
| Average price for the year | 10.23d. | 5.89d. | 3.14d. |

Value of Produce and Manufactures of the United Kingdom Exported to

| | 1929 | 1930 | 1931 |
|------------------------------------|-------------|-------------|-------------|
| Melaya | £15,564,299 | £10,474,848 | £ 6,340,355 |
| British Borneo, Brunei and Sarawak | 215,208 | 163,835 | 89,891 |
| Ceylon and Dependencies | 5,920,176 | 3,998,008 | 2,703,248 |
| Dutch East Indies | 9,399,000 | 6,295,187 | 3,358,458 |
| | £31,098,683 | £20,931,878 | £12,491,952 |

scheme of compulsory restriction of output or exports is brought in and enforced by the governments, production during 1932 will show little if any decrease from 1931.

No signs are discernible at present either in the U.S.A. or elsewhere of that revival in trade generally which would call for an increased consumption of rubber for motor transport purposes. Some countries which have been at a particularly low ebb during 1931 may show some slight improvement during 1932, while Japan and Russia may possibly show further expansion. We believe that the United States may use even less rubber in 1932 than they did in 1931 and estimate

their consumption at 340,000 tons. We do not feel we can make any estimate of the variations which may occur in consumption of other countries except as we have generally indicated above. We estimate total world consumption for 1932 at something between 650,000 and 660,000 tons.

The existing low price for rubber may bring about a further decline in the use of reclaimed and thus an increase in the use of raw rubber. No statistics are available for the rest of the world but the U.S.A. statistics show that the ratio of reclaimed to crude for the past three years was

46½ per cent for 1929, 42 per cent for 1930 and 35½ per cent for 1931.

The question which naturally rises to everyone's mind is why matters have been allowed to drift until the rubber industry finds itself in its present tragic situation. The main causes may be briefly summarized as follows:

1. Lack of agreement amongst producers themselves as to the means to be used to improve the situation.
2. The difficulties inherent in taking any steps to control the production of an article of which more than

(Turn to page 494, please)

JUST AMONG OURSELVES

Government Surgery May Cripple Patient

BIG doings in Washington lately. New taxes being levied. Automobiles getting it on the chin. Budget slashes in governmental expenditures, but still governmental pruning falls far short of what has been done in the average industrial concern.

Automotive industry will continue to make itself felt in battle for reduction in government bureau expenses, particularly so long as it is called upon to pay special taxes for such expenses. Congress classes the automobile with the luxury industries still, despite the existence on all sides of a civilization built largely upon the availability of individual transportation.

If there's any comparison from the utility standpoint between a radio and an automobile, we, for one, can't see it. And yet for taxation purposes the automobile is being classed alongside jewelry and the radio. Certainly the automobile industry will keep right on fighting for lowering of governmental expenditures to the point where special taxes become unnecessary.

While that fight is being continued, however, the industry might do well to consider that certain departments and certain bureaus are rendering a really practical and useful service to industry at relatively low cost.

Bureau of Foreign and Domestic Commerce, for example, comes close to operating as an export department for scores of small firms and saves thousands of dollars a year to large ones in procurement of specific demanded information.

We've been in close contact with this division of the government for many years and sincerely believe in the general efficacy of its work. Budget bureau and House committee have already cut the budget of this bureau nearly half a million dollars.

We think that's a good thing, but further slashes might well result in curtailment of services of immediate dollars and cents value to many automotive companies, both in the vehicle and the parts and equipment field.

The Boot on the Other Leg

"If the engineers of this industry had been as backward in conceiving and as antagonistic to reception of new ideas as have men in the sales end of the business—retail, wholesale and factory—we might still be riding around in cars with doors in the rear," said Roy Faulkner, Studebaker vice-president, to a group of dealers the other day.

Faulkner went on to show how factory engineers stay awake nights trying to think of ways to improve cars; how they are indefatigable in testing out every new idea over roads, on proving grounds and in laboratories.

Then he pointed to the difficulties often met with in getting an individual dealer sincerely and vigorously to try out new routines in selling; how strong is the tendency to say "It won't work" without adequate practical testing, and how necessary is mental flexibility in sales work at this time.

After all these years of hearing the engineer branded as the

high priest of conservatism and the ultimate in resistance to new ideas, it was refreshing to listen to this novel—and, we believe, sane—estimate of the situation.

The Color Line On Balance Sheets

LESS than half of the fourteen leading passenger car companies managed to stay out of the red last year.

General Motors leads in profits by a wide margin, of course, with net profits up near to \$97,000,000.

It is interesting to note that Nash stands second to the Big Corporation in net earnings for last year. Nothing sensational occurred at Nash last year either in the way of product or policy. Its high relative standing looks to an outsider to be due chiefly to sound management, consistent policies and effective and persistent doing of the multitude of sane things which go to make up good business operation. Nash profit last year was \$4,734,926.

The list of 1931 net profits in order:

| | | |
|----------------|-----|--------------|
| General Motors | ... | \$96,858,701 |
| Nash | ... | 4,807,681 |
| Auburn | ... | 3,579,849 |
| Chrysler | ... | 2,111,880 |
| Studebaker | ... | 859,805 |

The Service Manual As a Standard Gage

ONE manufacturer brought up an interesting point in connection with the repair and junking standards proposed in Joe Geschelin's paper at the last annual meeting of the S.A.E. Many heavy-duty trucks and buses are sold on the instalment plan. "If each maker made these standards available," he asks, "why couldn't the service manual serve as a par for the mechanical condition of the vehicle? And par on the health of rolling stock would protect and conserve the dealer's investment—perhaps make repossession worth more."—N.G.S.

Durable, Bright Chromium Finish Now Assured by Proper Processing

Recent research work shows how shortcuts and lack of control play havoc in automobile parts plating. Recommendations developed by experts will enable platers to achieve lasting finishes

by Joseph Geschelin

TWO one-hundred-thousandths (0.00002) of an inch is a mighty small unit. Yet that is the average thickness recommended for a good chrome-plating job for automotive bright parts. This "flash" of bright chrome plate rests on a cushion of copper and nickel 0.001 in. thick, deposited directly on the base metal. And—thereby hangs a tale!

If certain variations occur, due to intentional short cuts in polishing or electroplating, or due to an unintentional lack of control somewhere along the line, some undesirable things happen. Easily the most fatal of these is when some car owners suddenly discover that their beautiful bright plate is beginning to tarnish. Enough of this occurred some short time ago to energize the thinking of research workers concerned with the electroplating industry.

Fortunately, enough is known about chrome plating at the present time to assure a fine, durable, bright finish, provided all the steps in the process are controlled in accordance with recommended procedure. Perhaps the most instructive picture of the situation was given by Dr. William Blum of the Bureau of Standards in a recent talk at the Franklin Institute in Philadelphia⁽¹⁾.

The object here is to discuss in some detail the important aspects of the problem bearing directly on decorative chrome plating as it affects the automotive field. We are indebted for most of the material

to the work of many outstanding investigators who are doing so much to convert an art into a well-controlled science. In the main we shall confine ourselves to a consideration of the following elements: 1. Advances in nickel plating. 2. Consideration of different base metals. 3. Corrosion resistance. 4. Polishing materials and methods. 5. Patent situation.

As might be expected, concerted thinking in the field of electroplating was intensified and accelerated by the commercialization of rustless steel sheet and the competition of an all-lacquered ensemble. Early in 1930 Ford began the manufacture of rustless steel radiator shells. This development was studied by the writer and reported⁽²⁾ in *Automotive Industries*. However, somewhere around the middle of 1931 the project was abandoned for reasons concerning which we can only hazard a guess. Since then others have done considerable work with rustless steel stampings and there is reason to believe that at least the stamping problem could be placed on a paying basis by manufacturers.

An all-lacquer ensemble embracing most bright plate areas made its appearance at the 1932 auto show. Among those experimenting with a revival of this practice were Packard, Auburn, Graham and others. It is still too early to say how general this move might become. Suffice it to say the bright finish is still

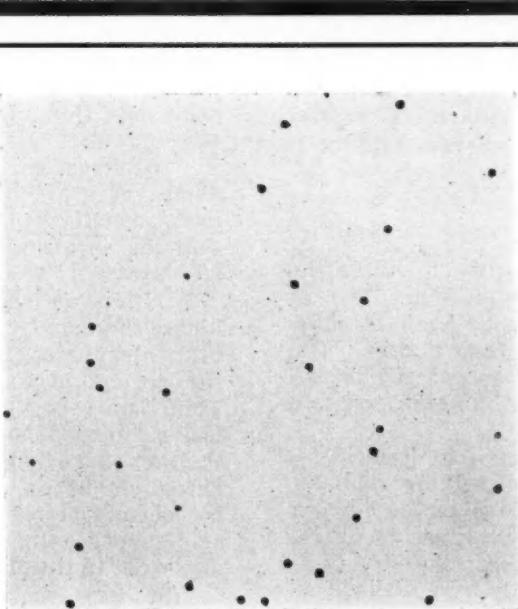


Fig. 1. Pores in thin chromium coatings on nickel (x40)
(from B. S. Jour. of Research, R.P. 368)

⁽¹⁾ "The Status of Chromium Plating," by William Blum. *Jour. of the Franklin Institute*, January, 1932.

⁽²⁾ "Ford Rustless Steel Radiator Shells Need 17 Press Operations," by Joseph Geschelin, *Automotive Industries*, July 12, 1930.

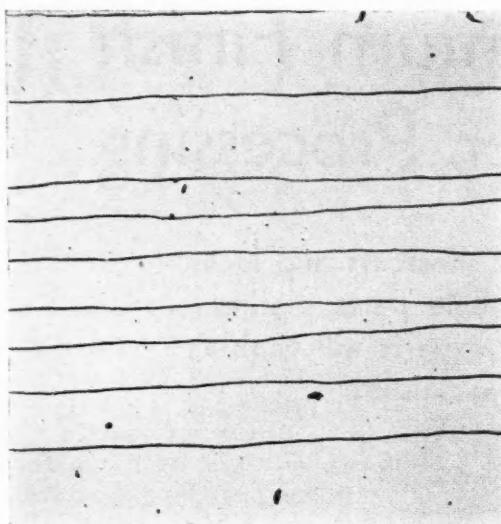


Fig. 2. Parallel cracks in moderately thick chromium coatings on nickel (x40)

(from B. S. Jour. of Research, R.P. 368)

with us, has wide public acceptance, and has many desirable features. In the automotive field it is the accepted finish for radiators, moldings, hub caps, lamp bodies, etc. With the entry of non-ferrous materials such as aluminum and zinc, moldings and hub caps and die-cast parts also are bright finished. Chrome plating is also reaching into other channels of automotive work. It increases the life of inspection gages and production tools, and has been tried on wearing parts such as shackle bolts, king pins, wrist pins, etc. For these reasons, and also because of the enormous capital investment in chrome-plating equipment, the status of chrome plating is of more than passing interest.

Basic Patent Situation

No doubt every one concerned with electroplating is well posted on the patents in this field. Two of these in particular are claimed to be basic in character and are founded on very broad claims. The following quotations are illustrative of the broadest claim in each. 1. U. S. Patent 1581188, granted April 20, 1926, to Colin G. Fink.

"A method of preparing solutions for electrodeposition of chromium, comprising dissolving commercial grades of chromic acid, ascertaining the amount of catalytic radicals therein, and adding to or removing from said solution sufficient catalytic radicals to make a total amount of catalytic radicals present in the solution equivalent to the proportion of 5 gm. or less of sulphate radicals per litre of solution containing 250 gm. of chromic acid." . . . A process for the continuous electrodeposition of chromium, comprising regulating the content of stable radicals (catalytic agent) in the bath to an amount not exceeding the proportion of 5 gm. of sulphate radicals per litre of solution containing 250 gm. of chromic acid."

2. U. S. Patent 1802463, granted April 28, 1931, to Colin G. Fink. This covers the general process of producing a chrome-plated finish that applies particularly to a definition of the range of bright plate.

"The process of producing a chromium-plate surface of a desired ornamental appearance upon an article having a metal or alloy surface which does not have formed thereon an insoluble precipitate when in contact with a chromic-acid plating bath, which consists in the following five steps in combination: (a) preparing said metal or alloy surface so that it has the ornamental appearance desired for the finished surface; (b) employing a bath prepared in the proportion of 500 gm. of chromic acid (C_2O_4) per litre and from 2 to 8 gm. of sulphate (SO_4) per litre or an amount of other acid radical equivalent in effect [the optimum being 5 gm. of sulphate (SO_4) per litre for a bath containing 500 gm. of chromic acid (C_2O_4) per litre] and a proportionately lower or higher sulphate (SO_4) content for a lower or higher chromic acid (C_2O_4) content: (c) selecting a temperature approximately 25 deg. C. to 55 deg. C., as indicated by the line X on the graph as about the bright plate range; (d) determining by reference to the accompanying graph the optimum current density to employ with the three conditions already selected in order to faithfully reproduce the ornamental appearance of the prepared surface: (e) electrolyzing while maintaining these conditions of composition, temperature and current density. . . ."

Quality Controls Corrosion

Consider corrosion. This is probably the most serious question concerned in bright plating. Numerous investigators have shown that corrosion resistance depends almost entirely upon the quality, uniformity and thickness of the undercoats. The chromium plate, when properly applied, reproduces precisely the finish of the nickel underneath. This is why the polishing, buffing and thickness of the nickel and copper plate are so important. Watts (3) comments that the only function of chromium is to prevent the tarnishing of some other metals beneath it. In investigating a large number of radiator shells, he concludes that a thin electroplate of any metal usually has initially many pin holes in it, and that these quickly develop with use. Only thick electroplates tend to eliminate these holes.

W. Blum and his associates (4) have shown that under the usual conditions of deposition, up to certain thicknesses, there is a minimum porosity when the chromium coating is about 0.00002 in. thick. Their last report shows the result of a semi-quantitative copper deposition test. This test is based upon the fact that copper will not deposit as readily upon chromium as on other metals. Accordingly, when the chrome-plated metal is made the cathode in an acid-copper bath, copper deposits only where openings exist in the chromium deposit extending through to the base metal! These openings are thereby delineated. By measuring either the average current or the weight of copper deposited on a given area under specified conditions, relative porosity can be roughly estimated. This is shown in Figs. 1,

(3) "The Plating on Radiator Shells," by Oliver P. Watts. Read at the Detroit meeting of the American Electrochemical Society, Sept. 25-27, 1930.

(4) "The Porosity of Electroplated Chromium Coatings," by W. Blum, W. P. Barrows and A. Brenner, B. of S. Research Paper No. 368.

2 and 3. The results show that by depositing the chromium at high temperatures and correspondingly high current densities, the cracking of thick deposits can be reduced to a minimum.

Both Blum and Watts lay particular emphasis on the poor throwing power of chromium solutions. This is evidenced in the plating of irregular-shaped articles such as radiator shells. The best results are obtained by expedients that make the distribution of current over the entire surface as uniform as possible. Watts found that the thickness of chromium usually is greatest on the front of the shells, and falls gradually or rapidly across the side to the back edge, depending upon the method of plating. Sometimes a minimum is reached about the middle of the side from which the thickness increases slightly toward the back edge.

Mougey (6) has discussed the pros and cons of the calcium chloride spray test. He indorses this test only as an aid in developing a more resistant chrome plate, and not as an ultimate production criterion. Obviously the only information gained from a calcium-chloride spray test is a measure of the resistance of the plated coating when exposed to calcium chloride.

Another interesting discussion in connection with corrosion of chrome-plated articles is the study reported by Phillips (7) relating to the tarnishing of chromium-plated brass. His report indicates that this condition was not the tarnishing of chromium, but a working through to the surface of the salts or oxides of the base metal, formed by chemical attack. The conclusion is that failure occurred either because chromium was plated directly on the copper and brass or because the copper or brass was plated with too small an amount of nickel before being chromium plated. His findings clearly discourage the idea of applying a thin coat of bright nickel on parts designed for outside exposure.

Hot Nickel Solutions

Since the consensus is that a thick nickel plate is necessary for adequate protection of base metals against corrosion, there has been considerable activity among research workers and in production plants in the development of a procedure for producing a heavy plate at low cost. An essential corollary to this work is the improvement of polishing and buffing equipment and method. Watts (8) gives the results of the survey of 30 plants using a hot nickel solution. The consensus of reports is that the hot solution, operating at about 120 deg. Fahr., and at current densities of about 20 to 30 amp. per sq. ft., is better than a cold solution. Chiefly, it produces a thicker and more ductile coat in less time.

Canning (9) tells of some interesting developments in high-speed nickel plating in England. The practice in that country is to employ current densities of 2.2 amp. per sq. cm. and over. Continuous filtration of the electrolyte, kept at 32 to 35 deg. C., is necessary to eliminate suspended foreign matter. To

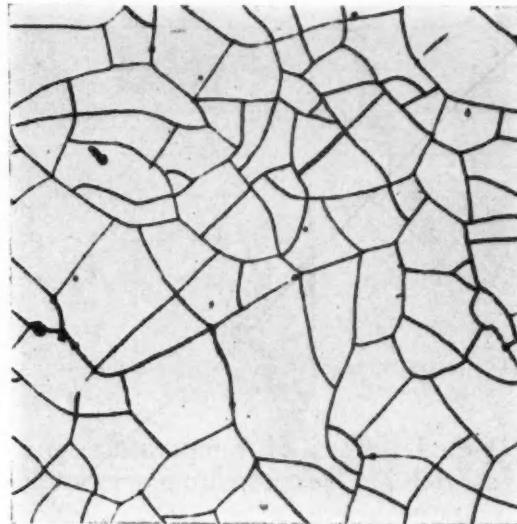


Fig. 3. Random cracks in thick chromium coatings on nickel (x40)

(from B. S. Jour. of Research, R.P. 368)

avoid any considerable loss in throwing power, the author recommends a pH. from 5.6 to 5.8. A plate 0.001 in. thick may be obtained in 45 min. with a variation of thickness of not more than 45 per cent.

When General Motors first began to look into improvements in nickel plating they had been maintaining the nickel solution at pH. values between 5.4 and 6.3, which was then the recommended practice.

One plant, probably more venturesome than the rest, began to show a marked improvement in quality by additions of sulphuric acid, which had the effect of producing a lower pH. Apparently the bath was being maintained at about 5.2 pH., but it was later discovered that the determination was being made with the usual brom cresol purple, which is not sensitive to values below 5.2. A detailed investigation showed that the actual value of the pH., when correctly determined, was about 2.5, and this was subsequently adopted as standard. According to W. M. Phillips (10), who reported this investigation, with pH. below 3.0, higher current densities are possible and good, heavy deposits are obtained in a shorter time. In this bath the nickel content may be kept constant by the thoroughly uniform anode dissolution which results. It is claimed that no peeling or cracking at the edges is apparent, and the bath remains perfectly clear. However, with the low pH. bath there is a greater initial tendency toward pitting. High bath temperatures are recommended for the low pH. bath.

Hardness vs. Wear-resistance

Hardness is one of the most important physical characteristics of chromium plate. Very recently R. Schneidewind (11) measured the hardness of electro-

(6) "Calcium Chloride Testing of Electropolated Deposits," by H. C. Mougey. Presented at the Detroit meeting of the American Electrochemical Society, Sept. 25-27, 1930.

(7) "A Note on the Tarnishing of Chromium-Plated Brass," by W. M. Phillips. Detroit meeting paper of the American Electrochemical Society, Sept. 25-27, 1930.

(8) "Progress of the Hot Nickel Solution," by Oliver P. Watts, at the Birmingham meeting of the Electrochemical Society, April 23-25, 1931.

(9) "High-Speed Nickel Plating as Practiced in England," by Ernest R. Canning. Meeting of the Electrochemical Society, April 23-25, 1931.

(10) "The Deposition of Nickel at Low pH.," by W. M. Phillips. Read at the Detroit meeting of the American Electrochemical Society, Sept. 25-27, 1930.

(11) "Hardness of Chromium as Determined by the Vickers-Brinell, Bierbaum and Mohs Methods," by Richard Schneidewind, Trans. of the ASST, vol. 19.

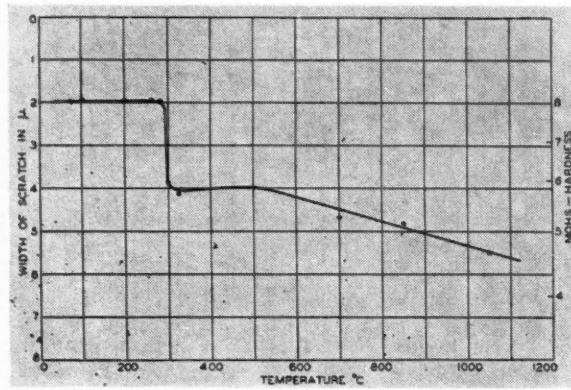


Fig. 4. Effect of temperature on scratch hardness of chromium plate
(after Schneidewind—see footnote 10)

deposited chromium by different methods, and attempted to correlate the results. However, he did not attempt to determine the relation of the hardness measurements to wear resistance. According to W. Blum, wear itself is a complicated phenomenon, and no simple, general relation between wear and hardness has been worked out. Experience with gages has shown that scratch hardness is a most promising but still only an approximate means for measuring this type of wear resistance. H. K. Herschman found that on gages chromium deposits produced under different conditions show appreciable difference in wear when there was no appreciable difference in scratch hardness. Plated gages that were subsequently heated to 300 deg. C. seemed to yield the best results.

Heat Overcomes Brittleness

It is believed that heat treatment expels hydrogen and, according to Schneidewind, decreases the scratch hardness. This is illustrated in Fig. 4, which shows that somewhere about 300 deg. C. there is a definite change in scratch hardness. Chromium, heat-treated at around this temperature, presumably is less brittle. Wirshing⁽¹¹⁾ recommends heating bright parts, such as radiators, lamps, etc., at 450 deg. Fahr. for 20 min. to improve their corrosion resistance.

Out of the many problems concerned with chromium plating, polishing probably has given the greatest concern, as it is still in the nature of a highly empirical art. Standardization is conspicuous by its absence except perhaps in some few large organizations. In the main there has been very little cooperative effort in the polishing field, and the empirical knowledge that is available has been jeal-

⁽¹¹⁾ "Heat Treatment of Chromium Plate Increases Resistance to Corrosion," by R. J. Wirshing, *Automotive Industries*, page 424, Sept. 19, 1931.

ously guarded, with the result that progress has been tedious and halting.

However, a number of unwritten laws have gained fairly wide acceptance. One of these is that the number of polishing operations controls the quality of the finished surface of the plating and has a bearing on its resistance to corrosion. Some tangible evidence of this is given by Blum in Fig. 2, where the parallel cracks in the finished plate seem to originate with the parallel scratches on the nickel plate, and are at right angles to these.

Metal Polishing Studied

What promises to be one of the most important developments in this connection is the study by Baker and Holbrook⁽¹²⁾ which describes the apparatus designed and built at the University of Michigan for the experimental study of metal polishing with flexible polishing wheels. While this study has no commercial application at the moment, subsequent work should correlate experimental results with commercial problems, and may go far to place polishing on a more scientific and therefore a more controllable basis.

Influence of Base Metals

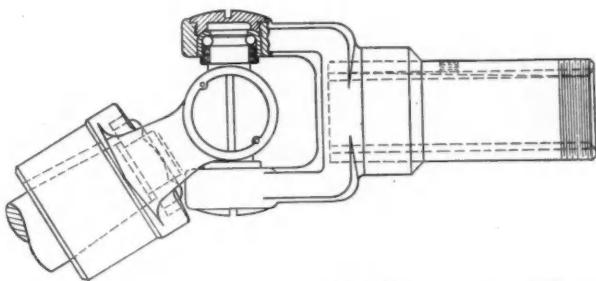
Another troublesome and certainly critical factor is the condition of the base metal and its influence on the quality of the finished surface. That there is much misconception about this will be evidenced from a reading of the discussion of a recent paper by Hogaboom⁽¹³⁾. Recently the writer made a personal inquiry into this problem by calling on the metallurgists for several of the large sheet metal rolling mills. The consensus is that the sheet mill can and will supply sheets that are absolutely acceptable for plating purposes. However, in each case the purchaser must specify on his order that the material is required for plating purposes, and should submit blueprints, from which the mill can determine the desired degree of ductility and the type of surface finish required. Generally, plating stock will require a special inspection of its surface to assure freedom from visible cracks, pits and other surface imperfections. Naturally this may increase the cost of the stock a little, but there is no question about the economy of paying a little more at this stage and saving on rejections because of the necessity of repeating the subsequent expensive operations. It is quite conceivable that some of the troubles reported by various platers are due to the skimping on the cost of the raw material.

Through the unceasing cooperative efforts of various large organizations, the problems of chrome plating aluminum and zinc, sheet metal and die-cast parts have been definitely controlled, and a standardized procedure worked out. Chrome plating of aluminum has been comprehensively covered by W. S. McArdle of the Aluminum Co. of America in a recent issue of *Automotive Industries*⁽¹⁴⁾. A similar report on the plating of zinc will appear shortly.

⁽¹²⁾ "An experimental Study of Metal Polishing by Flexible Polishing Wheels," by Edwin M. Baker and George E. Holbrook, presented at the Birmingham meeting of the Electrochemical Society, Sept. 23-25, 1931.

⁽¹³⁾ "Electroplating on Cold-Rolled Steel," by George B. Hogaboom. Read at the annual meeting of the American Electroplaters Society, June 30-July 2, 1931.

⁽¹⁴⁾ "Electroplating Aluminum on Production Basis Practicable With Process Control," by W. S. McArdle, *Automotive Industries*, Jan. 16, 1932.



Neapco ball-bearing universal joints are quickly and easily assembled

New England Auto Designs Ball-Bearing Universal Joint

THE New England Auto Products Corp. of Pottstown, Pa., which has been manufacturing universal joints for the replacement market for many years, recently developed a new type of ball-bearing universal joint which it plans to introduce on the market for original equipment. The firm states that its experience has shown that failure of universal joints in service is usually due to excessive wear and that this wear is caused either by failure to retain lubricant, improper application of the lubricant, "brinelling" (cutting through the bearing surface), flywheel action, inability to work at a sufficiently large angle or undue end thrust. In the design of the Neapco ball-bearing universal joint efforts were made to eliminate these faults.

Referring to the illustrations of the joint herewith, the yokes, which are made of heat-treated alloy steel drop forgings, may be either of the hub or flanged type. The cross-holes are of sufficient diameter so that the journal arms may be entered without difficulty. Each arm of the alloy-steel cross is profiled to act as the inner race of the ball bearing. The balls used are of high-chromium steel. The ball retainer, which is made to be a close fit in the crosshole of the yoke-arm, acts as the outer race. The balls, with grease, are placed in the ball retainer, and a metal inner shield, which prevents the balls from falling out, is pressed in.

The edge of this cup extends beyond the edge of the ball retainer. Within this inner shield cup are placed two packing rings separated by the packing separator. On assembling the joint, the outer shield is pressed on the journal arm, and after the opposite journal arms are placed in the respective yoke-arm cross-holes, the balance of the ball bearing and seal assembly just mentioned is readily inserted through the cross-hole and upon the journal profile. This seal assembly prevents the entrance of water, grit

and dirt, and retains the lubricant in the assembly.

The retaining cap provides a spherical support for the ball retainer and thereby is said to offset any irregularities of machining and distortion due to heat treatment. The retaining cap, which is screwed into the cross-hole, has a shoulder which ends up against an accurately located seat on the yoke arm. Before being screwed into place, the cap is filled with grease.

As the pair of retaining caps are screwed down to their seats, there is a corresponding movement of the balls until they finally contact with both races at a pressure angle of about 60 deg. On assembling the joint, some load is put on the balls, whereby the side wall of the ball retainer is sprung against the cross-hole wall, with the result that the joint is always tight, notwithstanding the fact that certain tolerances must be allowed in production machining.

When the joint starts rotating and load is applied, the pressures are equalized between the different bearings. With the application of further load, the balls are forced outward with a greater thrust, and the result is that the pressure angle of the bearing is increased and the end-thrust component decreased. It is claimed that automatic alignment and adjustment of the bearings are assured under all conditions.

Neapco ball-bearing universal joints are quickly and easily assembled, the successive steps in the assembling process being as follows:

1. Insert opposite journal arms (with outer shield) in the cross-holes of the yoke.
2. Insert ball bearing and seal assemblies.
3. Screw in retaining caps.
4. Center-punch to hold retaining caps in place.

Propeller shafts with hub yoke fittings are shipped with one hub yoke and its respective bearing assemblies unassembled.

Mixture Distribution in Engine Studied

Method evolved for routine testing gives temperature curve claimed to be as accurate an index of air/fuel ratio as CO_2 curve or indicator-card data

LAST week we discussed the need for a routine test for mixture distribution in automobile engines, analyzing several methods for checking the mixture characteristics now in use.* The next step in our work was to apply the temperature method to multi-cylinder engines, with the object of working out some routine test.

*"Mixture Distribution in Cylinder Studied by Measuring Spark Plug Temperature," page 450, *Automotive Industries*, March 19, 1932.

Part 2 Continued from Last Week

A six-cylinder engine of conventional design was equipped with individual exhaust pipes; the same equipment was used as in the single-cylinder tests, and the procedure also was similar. The engine was run at 1500 r.p.m. under full load, and the fuel flow was varied

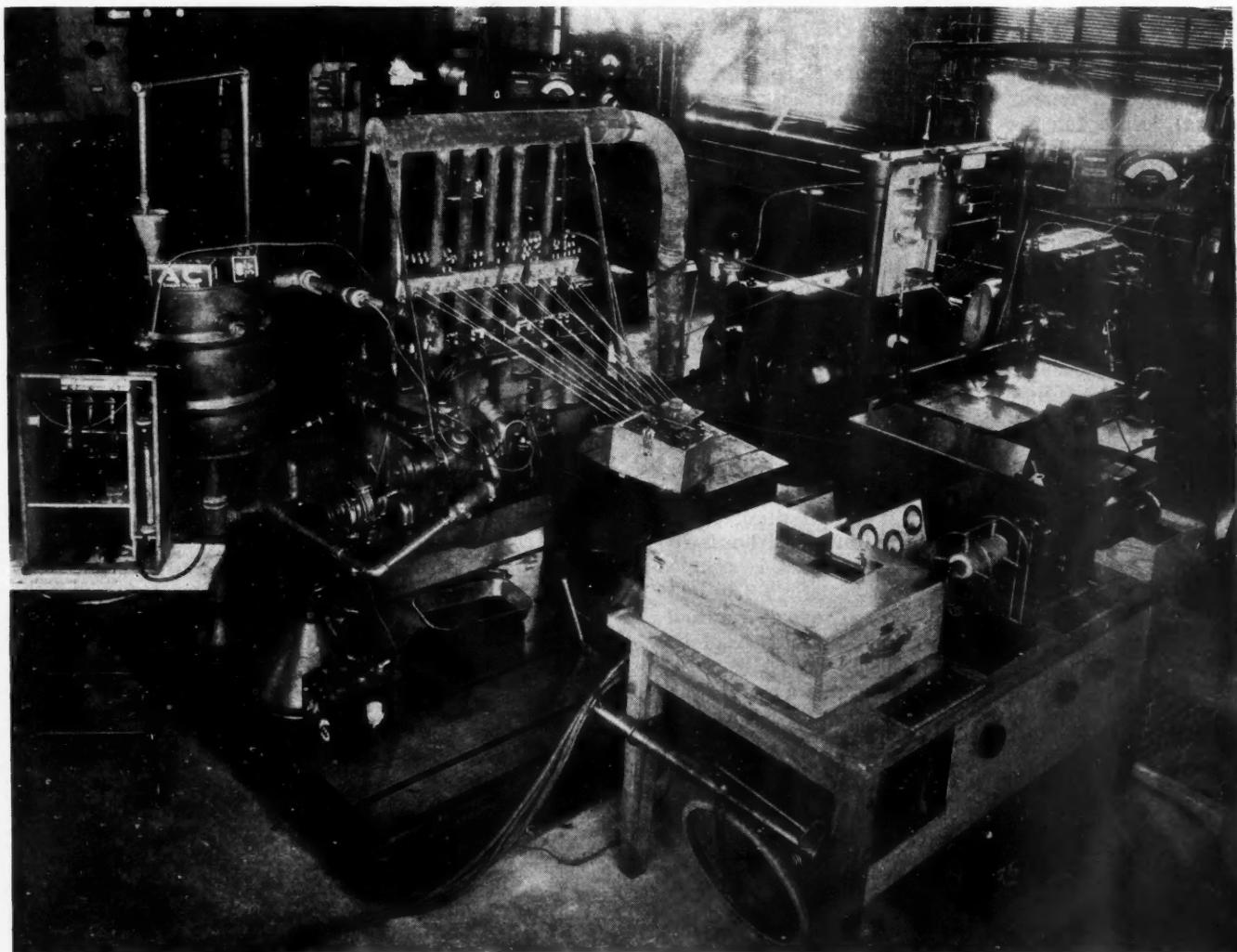


Fig. 9—Setup for mixture-distribution test on six-cylinder engine

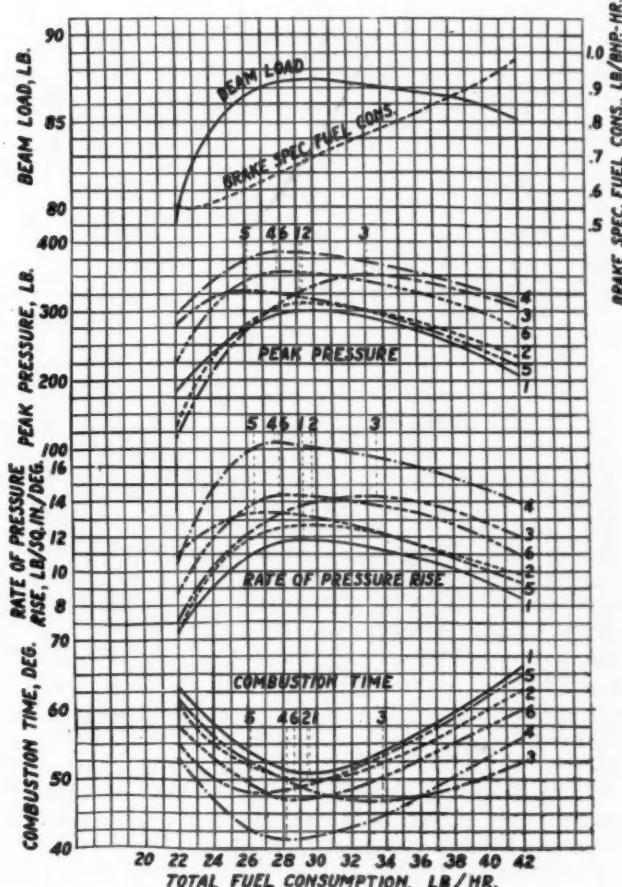
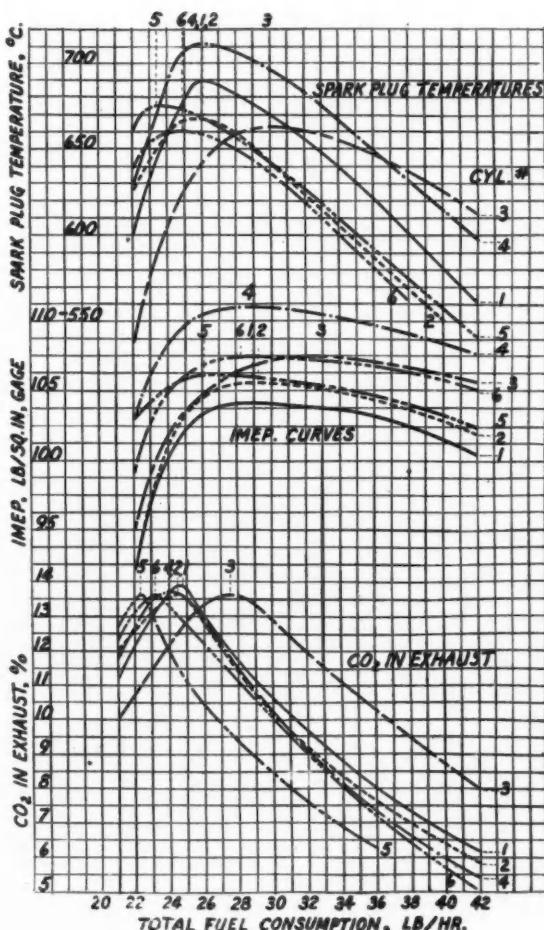
by Measuring Spark Plug Temperature

by Hector Rabezzana

Chief Spark Plug Engineer

and Stephen Kalmar

Research Engineer, AC Spark Plug Co.



Figs. 10A and 10B—Results of tests on six-cylinder engine

over the entire range of air/fuel ratios. Owing to the fact that same indicator was used for all cylinders (to eliminate errors due to possible differences in calibration) it was necessary to take all the indicator cards in one cylinder first, then proceed to the next one, etc. However, to minimize errors, all other readings were taken in all six cylinders at once, so that in the end six sets of readings were available, which made checking possible. The fuel was the same as that used in the single-cylinder tests (Standard Oil-Ethyl), and a set of carefully matched "thermocouple" spark plugs were used. The whole setup is shown in Fig. 9.

The results of this test are plotted in Figs. 10A and 10B. It is readily seen that CO₂, temperature, i.m.e.p., peak pressure, rate of pressure rise, and combustion-time curves for the individual cylinders are far from being congruent. Considering the i.m.e.p. curve first, it is seen that the peak values differ considerably. This

is undoubtedly due to variations in volumetric efficiency, since the combustion-chamber volumes were exactly alike. A compression test at the same speed gave the same relative results. Next in order of interest in the same curve group are the relative locations of the peaks. The peaks of cylinders Nos. 1, 2, 4 and 6 are very close to the leanest point for maximum power on the engine load curve. This means that these cylinders are getting maximum-power mixtures at that engine setting. The peak for cylinder No. 5 is on the lean side, while that for No. 3 is on the rich side. The CO₂ curves show the same characteristics. It is of interest to note that all i.m.e.p. peaks are located approximately at 10.5—11.5 per cent CO₂ content, which corresponds to air/fuel ratios of 11.6—12.3 on the curve in Fig. 6. The temperature curves, also, present the same picture with respect to the relative locations of the peaks of individual cylinders, and the same is true of peak pressures, rates

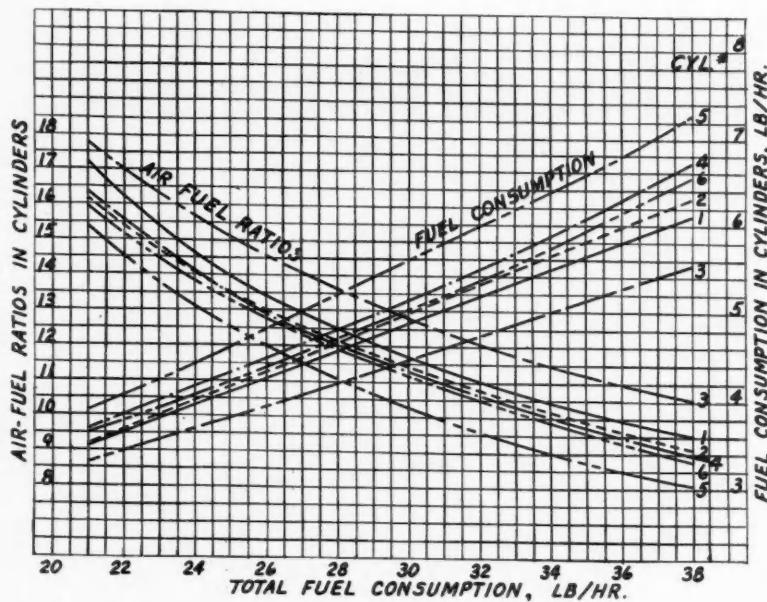


Fig. 11—Air/fuel ratios and fuel consumptions of individual cylinders

of pressure rise, and combustion-time curves. On the combustion-time curve the minimum point corresponds to the peak point in the other curves.

In determining the mixture ratios obtained in the individual cylinders, the first step was to determine from the single-cylinder test results the location of the temperature-curve peak. For combustion chambers of conventional design, i.e., of uniform height over both valves and the whole piston, the location of the temperature peak corresponds to a fuel consumption of approximately 90 per cent that at maximum load. The consumption at maximum load is 29 lb./hr. If all cylinders received the same amount of fuel, all the temperature curves should peak at 26 lb./hr. (90 per cent of 29 lb./hr.)

In most cases the majority of the cylinders actually do receive a proper mixture; therefore, we are not far from the truth in assuming that the temperature curves of the cylinders having proper mixtures will peak at this point.

Going back to our temperature curves, we see that cylinders Nos. 1, 2 and 4 peak at 26 lb./hr. consumption. No. 6 peaks at 25 lb./hr., No. 5 at 23.5 lb./hr. and, finally, No. 3 at 30 lb./hr.

As a measure of the relative richness or leanness of the faulty cylinders, the mean increase or decrease in engine consumption necessary to bring up the "lean" or "rich" cylinder to its full power, can be used. In our case this value, expressed in per cent of the maximum-power consumption, is 15.5 per cent for No. 3; i.e., 15.5 per cent fuel must be added to the maximum-power consumption in order to bring up Cyl. No. 3 to its full power; or, in other words, Cyl. No. 3 is 15.5 per cent lean. On the other hand, Cyl. No. 5 is approximately 9 per cent rich.

To check this hypothetical method of evaluating the relative richness or leanness of cylinders, the following analysis was made:

At several points, covering the entire fuel-consumption range of the engine, the actual fuel consumption of each cylinder was evaluated. This was done by first determining the air/fuel ratio of the cylinders at that point; then the air consumption, and from these two

values, the fuel consumption. The air/fuel ratio was determined by means of the CO_2 curve (Fig. 6). The air consumption per cylinder was computed by dividing the total air consumption by 6 and then multiplying this value by the "charge factor" of the cylinder in question. The charge factor is the ratio of the "cold" compression to the average compression of all cylinders at the same speeds. With these data at hand, a cylinder fuel-consumption curve and the air/fuel ratios of the individual cylinders were plotted against engine fuel consumption in Fig. 11.

The specific fuel consumption curves of the individual cylinders (Fig. 12) shows the characteristics of the cylinders very plainly.

We based our analysis on the fuel consumption rather than on the air/fuel ratio for the reason that very few automotive laboratories have reliable air-flow measuring apparatus at their disposal.

To check our method, another test was made on the same engine under full load at 1500 r.p.m. but, to eliminate differences in qualitative distribution, illuminating gas was used as fuel. As expected, all i.m.e.p., temperature, and CO_2 curves of the individual cylinders peaked at nearly the same point, indicating that all cylinders were getting qualitatively identical mixtures. Differences in peak values were still evident, and were due to differences in the amounts of charge in the various cylinders.

For tests of mixture distribution in a multi-cylinder engine, the following procedure was worked out:

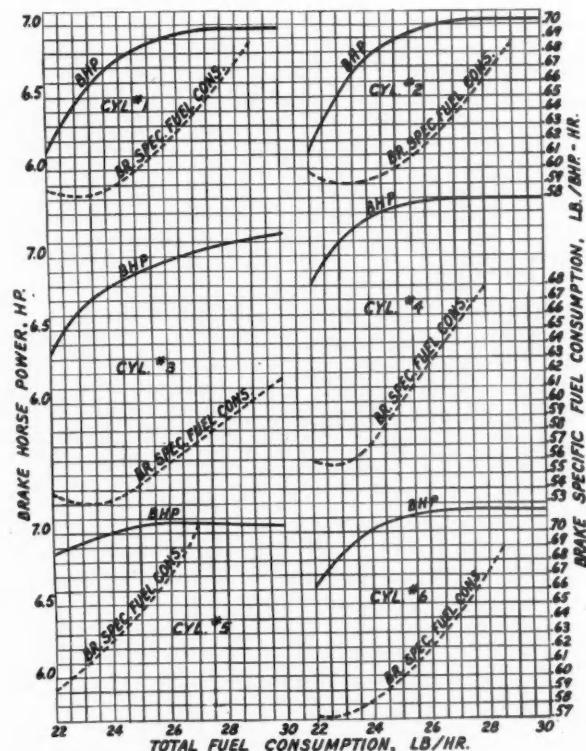


Fig. 12—Horsepower and brake specific fuel consumptions of individual cylinders



Fig. 13—Special setup for routine testing, including indicating pyrometers, a tachometer, an electric clock and a movie camera

First, spark plug temperature readings are taken in all cylinders, under full load at all speeds, with the standard carburetor setting. At each speed the engine is thoroughly stabilized, and particular care is taken that the speed remains constant while the temperatures are read. Temperatures are then plotted against speeds. Unstable mixture conditions are easily recognized by breaks in the continuity of the temperature curve, or reversals. The critical points are then thoroughly analyzed by making a complete air/fuel ratio test at each of the critical speeds. A variable jet should be used in the carburetor, and enough readings should be taken to make it possible to plot a set of temperature curves similar to those in Fig. 10.

The same procedure should be followed through under partial loads.

For development tests, first an air/fuel ratio test should be made at the most critical setting, and this test should be repeated with every step in the development.

For routine testing, special recording apparatus was developed consisting of the setup shown in Fig. 13. Twelve indicating pyrometers, a tachometer, and an electric clock are mounted on a board, and a movie camera is attached to take the picture of the entire board. Exposures can be made either by releasing a

contact (single exposure, for stabilized conditions) or automatically, at intervals of 1 to 3 seconds (continuous exposures for transient conditions). The pic-

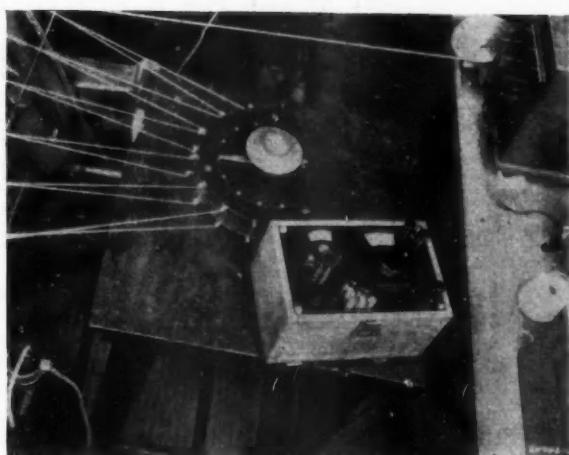


Fig. 14—Multiple-point rotary switch for connecting thermocouples to indicating instrument

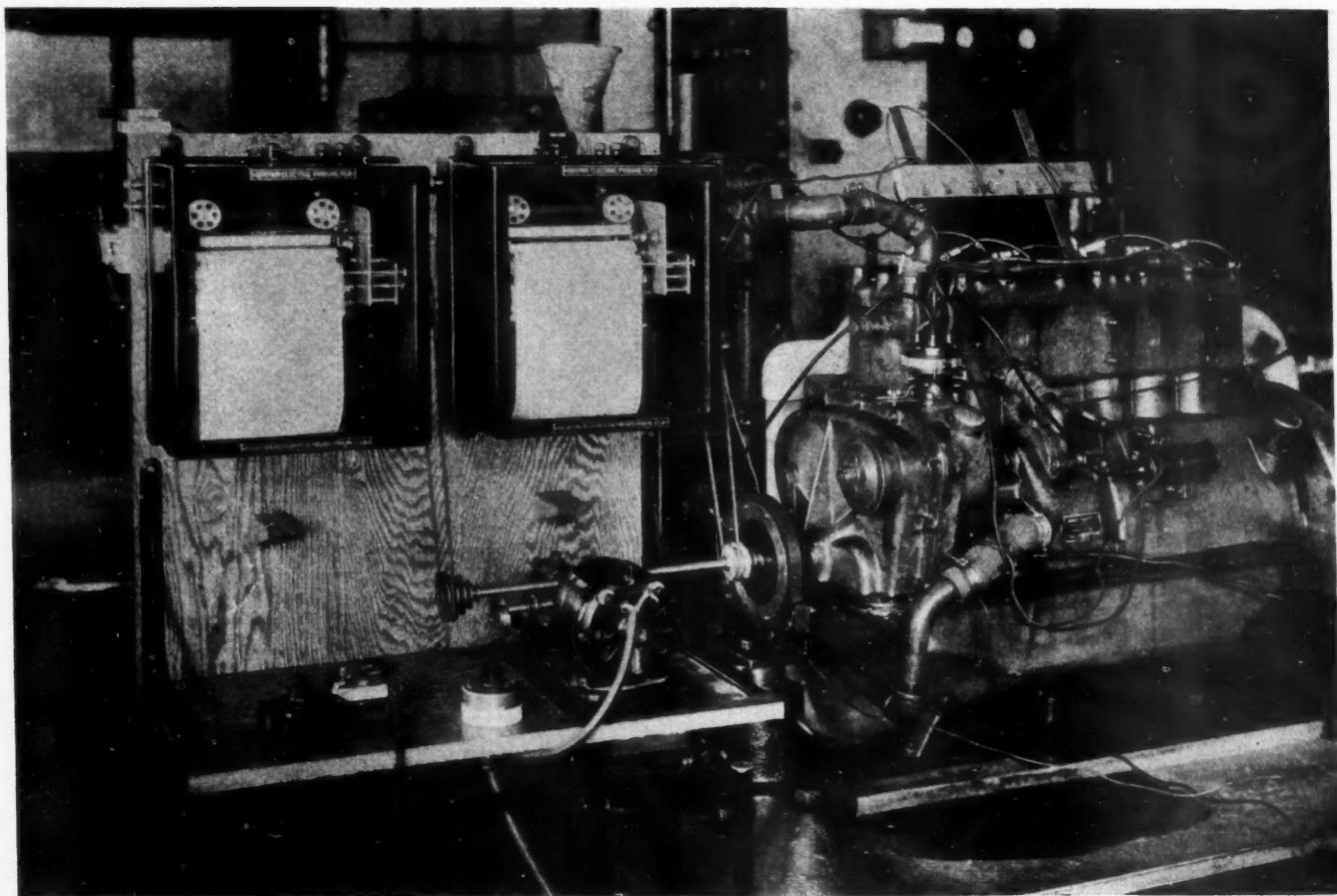
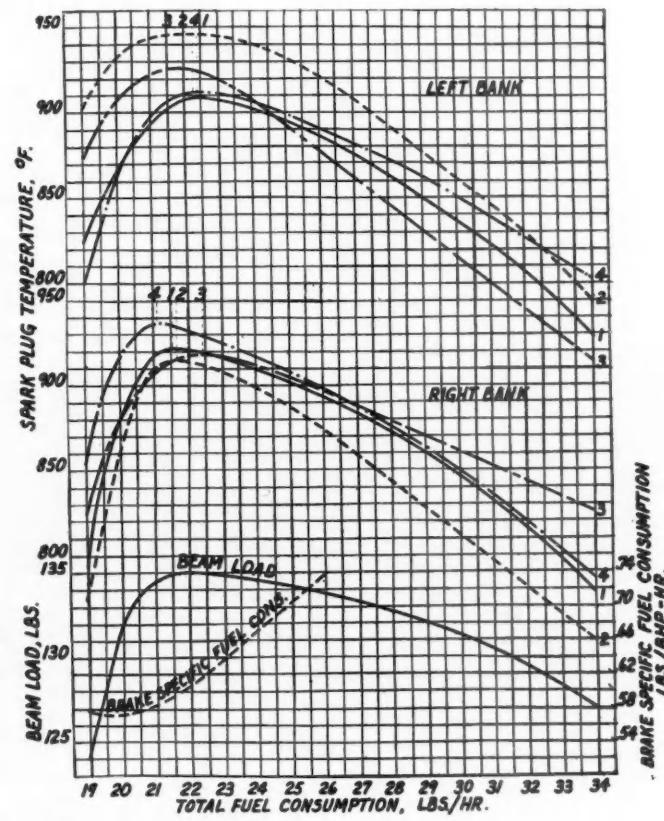
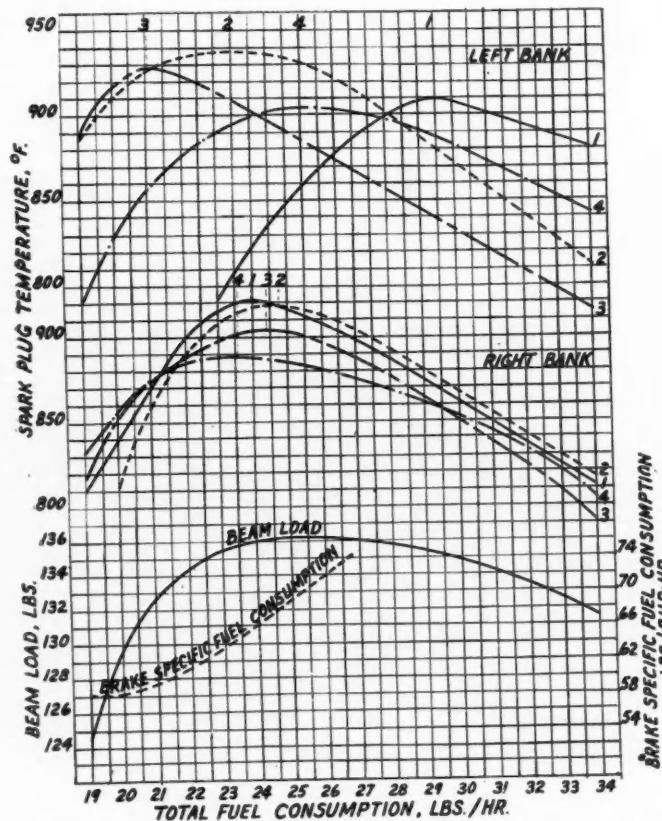


Fig. 15—Setup comprising double recording pyrometer for simultaneously recording engine speed and spark plug temperature in one cylinder



Figs. 16A and 16B—Test results obtained from an eight-cylinder V-engine before and after a change in throttle location made to improve distribution

tures are developed, and with the aid of a special projector, the values are tabulated. With this apparatus it is possible to record any stable or transient mixture condition in multi-cylinder engines with up to twelve cylinders.

For stable conditions, a potentiometer is quite satisfactory. It should be kept in mind that the whole instrument is at sparking potential (3000-7000 volts) and, therefore, no metal part of it should be touched while it is connected to any of the firing plugs. Both sides of the thermocouple are at the same potential (the sparking voltage), so the superimposed thermo electromotive force is not affected.

If all temperature readings are taken with one instrument, it is convenient to use multiple point rotary switches (Fig. 14), from which wires are led to an insulated strip fixed on the cylinder head and extending over all plugs. This strip is provided with clips similar to those to be found on some radio batteries, to which the thermocouple wires of each plug are tightly clamped.

These thermocouple wires are about 10 in. long each.

For records of a single cylinder, a double recording pyrometer can be used, specially adapted to record speed and spark plug temperature simultaneously (Fig. 15). This instrument can also be used in a car mounted on a carefully developed vibration-free frame. The speed record is taken from the speedometer drive, by means of a tachometer magnet, and the spark plug temperature of each cylinder can be recorded separately by operating a series of switches mounted on the instrument board.

In conclusion, some typical curves are shown in Figs. 16A and 16B. They represent the temperatures of an experimental V-8 engine "before and after" a change in the throttle location. With the original throttle valve location, the right bank shows very good distribution, while that of the left bank is not so good. After the position of the butterfly valve was changed, both banks showed equally good distribution, as may be seen from the charts.

S. P. A. Announces New Eight-Cylinder Pierce-Arrow Medium-Duty Truck Chassis

S. P. A. TRUCK CORP., Buffalo, N. Y., announces a new Pierce-Arrow eight-cylinder commercial vehicle chassis rated at 13,000 lb. maximum gross weight. The eight-cylinder engine, of 3½ by 5-in. cylinder dimensions, is rated at 125 hp. at 2800 r.p.m. and is said to develop a torque of more than 270 lb.-ft. over the speed range 1000-1900 r.p.m. The engine is of the L-head type, with nine crankshaft bearings, and with a vibration damper at the forward end of the crankshaft.

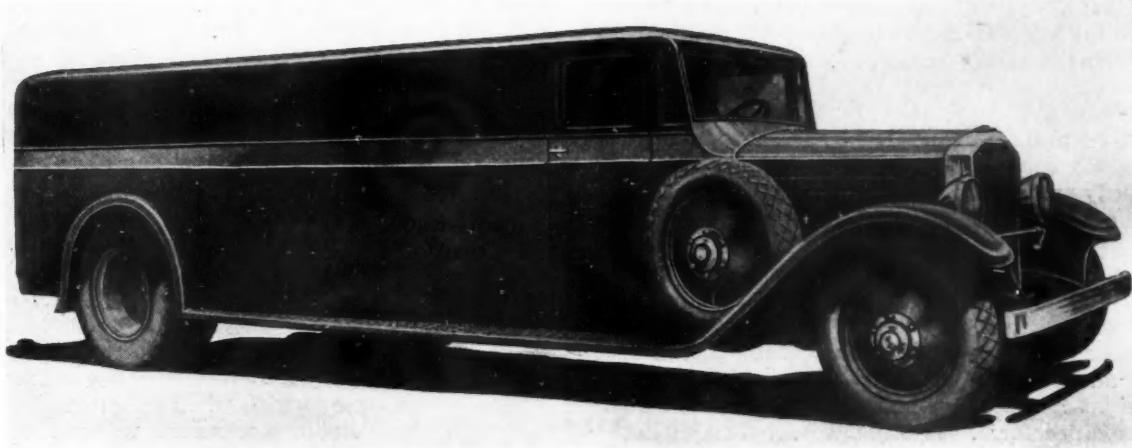
A silencer and air cleaner is combined with the carburetor. The six-blade radiator fan is driven by two V-belts. Engine temperature is controlled thermostatically and a temperature indicator is mounted on the dashboard. A four-speed and reverse transmis-

sion is fitted. It is of Brown-Lipe manufacture.

The frame, which is heat-treated, has side rails with a maximum section of 7½ by 4 by 3/16 in. Springs are semi-elliptic, 38 by 2½ front and 56 by 3 rear, with helper springs at the rear. The rear axle is of the full-floating, spiral bevel gear-driven type, and is joined to the frame by radius rods.

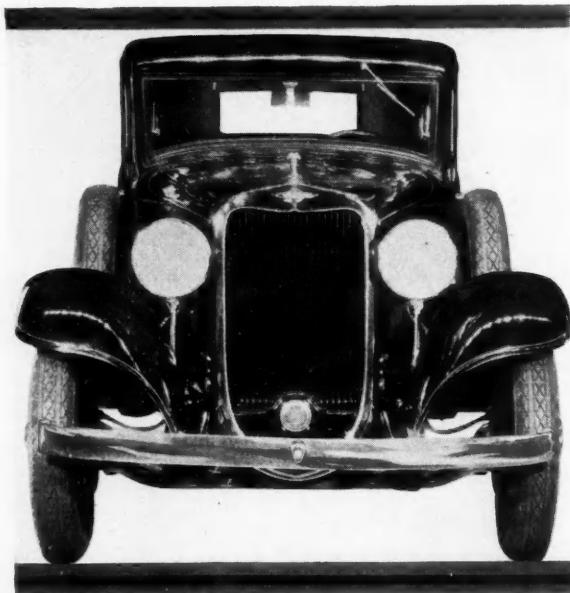
The standard tire equipment is 8.25/20 balloon, with dual rears. The four-wheel duo servo brakes are operated through a vacuum booster. The chassis is furnished in wheelbase lengths of 160-220 in.

As may be seen from the accompanying photograph, the front-end appearance resembles that of modern passenger cars, the inclined windshield and continuous running board being particularly striking.



Pierce-Arrow medium-duty eight-cylinder truck

Four-Cylinder Dodge, Priced Under \$600,



In appearance the Dodge Four line resembles the 1932 Dodge six and eight lines

AFTER more than four years of retirement, a car whose name is associated with the growth of one of the most prosperous of the old-time companies in the automobile industry, makes its reappearance—the Dodge Four.

Designed and built exclusively for the overseas markets, the Dodge Four, 1932 edition, is to be priced in the lowest-priced bracket, with a factory base list well under \$600. It is a large car and modern in every respect, with a wheelbase of 113 in., a 65 hp. engine with a floating power mounting; it comes equipped with free wheeling, an automatic clutch (at slightly extra cost); streamlined all-steel bodies, with sloping windshields; X-type frames; five 18-in. wire wheels, with 5.25-in. section tires; silent second helical gear transmission; steering shock eliminating shackle at the right front spring; composite steel and cast-iron Centrifuse brake drums with hydraulic brakes; counterweighted crankshafts, and Duplate safety glass (at slightly extra cost).

Four body models are offered in the line, a four-door sedan, a roadster with rumble seat, phaeton for five, and a five-passenger convertible sedan. In appearance the new cars resemble the 1932 Dodge six and eight-cylinder lines, as may be noted from the accompanying illustrations.

Mechanically there is also considerable similarity, virtually all the features found on the higher-priced six and eight-cylinder cars being duplicated on the new four in modified form. In other words, there is nothing cheap except price about the new cars. With it, Dodge overseas dealers, who do not carry the Plymouth

Resembling in outward appearance the Dodge sixes and eights, the 1932 version of a famous model will enable overseas Dodge dealers who do not stock the Plymouth, to enter low-priced competition

except in isolated instances, will be able to compete in the lowest-priced field.

The four-cylinder engine is of the L-head type with a bore and stroke of 3 5/8 by 4 3/4 in., for a piston displacement of 196 cu. in. and an N.A.C.C. rating of 21.03 hp. Its peak of 65 hp. is developed at 3000 r.p.m. Included among the engine features, in addition to those already mentioned, are the following items: Air cleaner, fuel filter and fuel pump combined, accelerating pump on the Carter plain tube single adjustment carburetor, automatic spark advance, interconnected throttle and choke controls to prevent overloading of the intake manifold; automatic intake heater, intake silencer; aluminum alloy pistons; steel-backed babbitt-lined bearings; steel starter gear shrunk on flywheel; manual shift starter engagement; pressure lubrication to main, crankpin, and camshaft bearings and timing chain; oil filter; crankcase ventilator equipped with integral air cleaner; pump circulated water system; flexible radiator mounting; heat indicator on dash, and a three-bearing, 55-lb. counterweighted crankshaft.

Clutches are of the 8 7/8-in., single-plate type with spring-type shock-absorbing hubs. Transmissions as has been mentioned have helical gears for second-speed and countershaft drive. All transmission bearings except for the reverse idler shaft are of the anti-friction type, either roller or ball. At the rear of the transmission is to be found the hand brake drum and the cam and roller type free-wheeling unit similar to that used on other Dodge models.

This, together with the automatic clutch mechanism (at extra cost), results in disconnecting the transmission both at the front and rear from the remainder of the car whenever the foot is removed from the accelerator pedal, so that any forward gear can be engaged at that time. A free wheeling lock-out is provided on the dash, which when operated also cuts out the automatic clutch mechanism, so that the car can be operated in the conventional manner whenever desired. An automatic reverse lock-out temporarily also

Revived for Competitive Overseas Market

cuts out the free wheeling and clutch action while reverse is engaged.

Universal joints are of the ball and trunnion type. Rear axles are semi-floating with pressed steel housings of the banjo type. Ratio of the spiral bevel finish drive is 4.33 to 1. Axle shafts are of chrome-nickel steel $1\frac{3}{8}$ in. in diameter at the outer bearing end. Ring gears and pinions are lapped before assembly for quietness. All rear axle bearings are of the Timken taper roller type, with double bearings at the wheel ends.

Front axles have I-beam center sections and ball thrust bearings at the steering knuckle heads. Steering gears are of the worm-and-sector type with heat-treated drop-forged steering arms and three-spoke thin grip steering wheel. A kick shackle is provided in the spring suspension to eliminate wheel fight.

Springs are semi-elliptic. Width for both front and rear is $1\frac{3}{4}$ in. and lengths are $35\frac{1}{2}$ and $53\frac{1}{2}$ in. respectively. At the front ends of the rear springs there are rubber-bushed shackles, while at the rear ends and for the front springs there are threaded metal shackles of a novel design.

These consist of a U-shaped bolt, both legs of which are threaded into a bushing which in turn is threaded into the spring eye and frame bracket—in such a manner that there is perfect freedom of rotary motion, while the threads prevent sideways motion. The threads are also effective in preventing the lubricant from oozing out of the shackle without lubricating it when the pressure gun is applied to the Zerk fittings. The threads form minute reservoirs which fill up with lubricant to form oil cushions. The idea has been used

in a different form by Rolls-Royce for a number of years. Hydraulic shock absorbers are included in the suspension system.

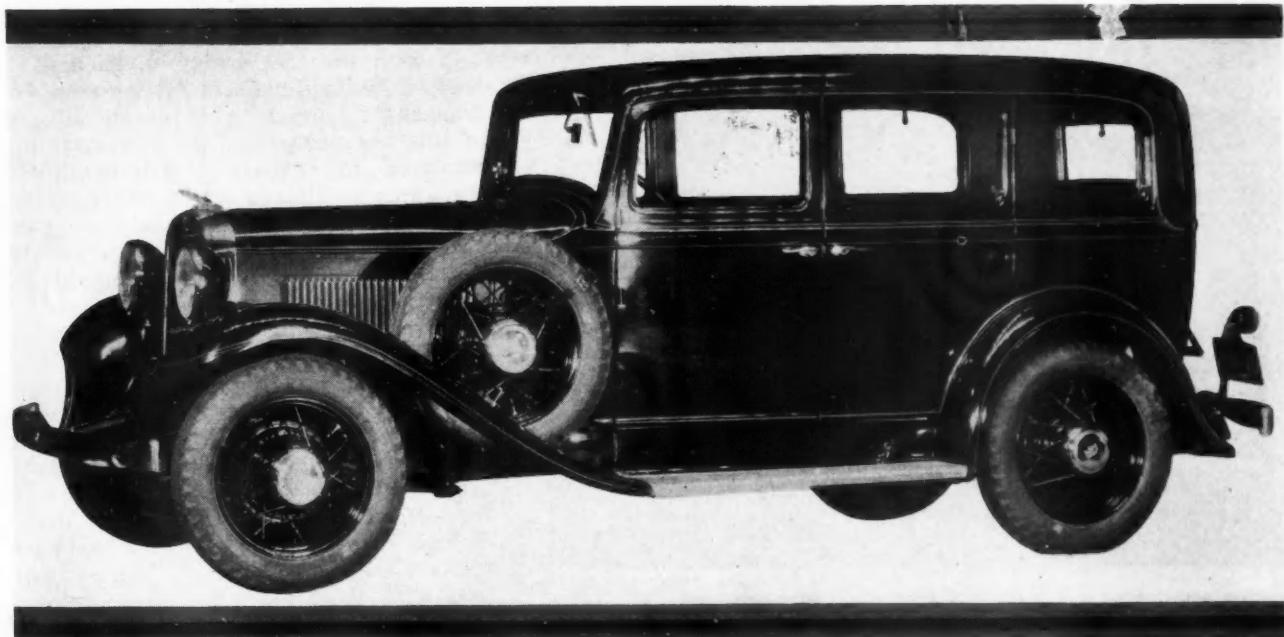
Brakes have already been mentioned. Service drums have an inside diameter of 11 in. and the internal expanding shoes carry $1\frac{1}{2}$ -in. width molded lining. Hand brake drums are 6 in. in diameter and 2 in. wide.

Frames, in addition to having a large X-type center cross-member, are of the double-drop type for low overall height. Side channels have a maximum depth of 6 in.

Included in the electrical system are an 84 amp. hr. storage battery, twin filament headlights, and rear traffic signal. The rear-mounted gasoline tank has a capacity of 12 gal. (10 imperial gal.; 43.4 liters). Capacity of the oiling system incidentally is 6 qt. (5.667 liters), and that of the cooling system $3\frac{5}{8}$ gal. (13.72 liters). The radiator is of the cellular type with chrome-plated shell. There is also a four-bladed, 16-in. diameter, V-belt driven fan.

Considerable attention has been given to neat appearance of body sheet metal over a period of time. All of it is rust-proofed before finishing and fenders and body are welt-insulated from each other. Running boards are of pressed steel with molded rubber coverings.

Body equipment includes cowl ventilators, automatic windshield wiper, non-glare rear-view mirror, indirectly lighted instrument panel carrying an engine-heat indicator and dash gasoline gage in addition to the usual instruments; light controls and horn button on the steering wheel.



The four-door sedan shown is one of the four bodies offered by Dodge for overseas trade

American Rubber-Pile at End of 1931 Big Enough to Carry On 13 Months

(Continued from page 479)

40 per cent is produced by native cultivators.

3. The world crisis in trade and industry which has turned a more or less progressive increase in consumption up to 1929 into a steady decrease since that year.

4. The misinterpretation by many producing companies of a policy outlined by the Rubber Growers' Association in September, 1930, the so-called "economic crop." A majority of the producing companies have apparently interpreted this policy as meaning that, regardless of the quantity produced, they should regulate their output so as to achieve the lowest possible cost per pound. It goes without saying that with a large output over which overhead costs can be distributed, the cost per pound will be lower and the greater the output the lower the cost. This policy has been pursued quite regardless of the world's possible requirements, that is to say, without thinking how the rubber so produced was to be eventually marketed.

5. The continuance from month to month of Anglo-Dutch restriction negotiations. Talk of government action which would bring about an improvement in the situation has been recurrent for the past two years and has no doubt kept many estates in production which might otherwise have closed down long ago.

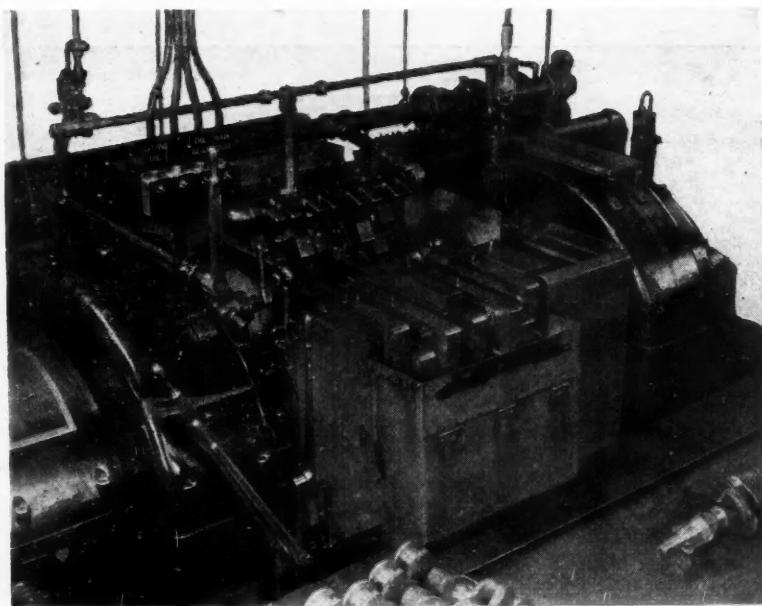
6. A lack of appreciation by the majority of producers and by their leading bodies of the seriousness of the situation. A conspicuous instance of this was when the Dutch Committee as late as July 15, 1931, published a statement for which they claimed the au-

thority of the Rubber Growers' Association that production and consumption for the year should approximately balance at about 730,000 tons. According to our estimates production actually worked out at 791,500 tons and consumption at 663,000 tons, a surplus of 128,500 tons. The trend in this direction was amply evident to anyone with access to trade statistics quite early in the year.

Assuming that conditions of transport remain normal, we consider that total stocks in the world amounting to four and one-half months' supply should be sufficient to meet all ordinary requirements and prevent abnormal fluctuations in price. This allows for one month's accumulation of stock on the estate, two weeks' transport to port of shipment, six weeks' transport to factories, and one and one-half months' supply in the factories. We are well aware that some authorities consider that an even larger supply is necessary, but unless a reserve stock is considered necessary to provide against possible strikes, wars or other causes which might interrupt transport, we think four and one-half months' supply is ample for all requirements.

It will be seen that calculating on the above basis, and without allowing anything extra for the unrecorded stocks mentioned in the preceding paragraph, possibly amounting to 70,000 tons, we find that the surplus stocks over and above world requirements amounted at end of 1931 to the unwieldy figure of 390,000 tons, while America had enough rubber at hand to carry her on for 13 months without buying another pound.

Saves Time on Crankshaft Operations



Cheeking and turning all crank pins on Hudson cars all at one time. This is a finish turning up preparatory to grinding. Only machine doing 20 per hour average. Holds angular index and spacing close to limits, protects grinding wheels. Index held to 0.002 on finished draft. Final developments of machine at Hudson plant. Integrally forged strut makes shaft difficult to turn and requires more cheeking. About twice production on turning and cheeking can go to 25 per hour

A MACHINE which has been specially designed by the suppliers in conjunction with the tool design division of the Hudson Motor Car Co. is setting records on crankshaft production in the Detroit plant of this organization. The new machine is employed for checking and turning all crankpins on Hudson eight-cylinder crankshafts simultaneously preparatory to grinding. According to Hudson production men this machine is capable of turning out twenty crankshafts per hour.

It was originally designed by a company specializing in machines for particular purposes and afterwards redesigned in co-operation with Hudson production men and rebuilt so that now it differs in many particulars from machines employed to do this type of work. Because of the integrally-forged counterweight, the Hudson shaft is difficult to turn and requires a more complicated checking operation. It is estimated that with these machines about twice the production on turning and checking can be secured as compared with previous methods. It is anticipated to eventually work this production up to 25 per hour.



Assembly line for Bedford trucks at the General Motors Works, Luton, England

Improve Buying

W. H. Rastall, chief, industrial machinery division, Department of Commerce, makes some telling points concerning the machine tool industry in *Mechanical Engineering* for March, 1932. His analysis of business activity shows that the fluctuations in machine tool activity are much more violent than for any other industrial group. Moreover, the machine tool curve seldom rises on the profit side of the business curve. Yet here is a basic industry representing a huge capital investment. And having a lot to do with the ups and downs of the business curve, in the opinion of many economists. The remedy suggested by Mr. Rastall and one which has been recommended by Dr. Julius Klein in this publication, is to inaugurate a better buying policy. Planned buying of machine tools is the only logical answer.

Automatic Chrome Plating

What do you think of the idea of a self-contained machine tool which will plate small tools automatically? The general idea is to build a compact machine suitable for use in a central tool store. You grind the tools, then plate them. What a set-up. It's no pipe-dream either. A large organization that knows what it's all about has already designed it and may build an experimental machine soon.

Most Progressive

If the 1930 inventory of metal-working equipment proves anything, it proves that without exception automotive manufacturers are the most progressive. Not only do they use the most modern equipment but the turnover is much swifter. Automotive manufacturers are on their toes all the time.

Automotive Industries

PRODUCTION LINES

Hard Plating

While we have been speculating on the possibilities of chrome-plating drills and other forms of cutting tools, it seems that the job has been done by some people for many moons. When plated properly, drills, files, reamers, broaches, and the like will give many times their normal life. Wonderful opportunities here for salvage as well as new tools.

Reclaimed Rubber

The ratio of reclaimed to crude rubber is about 35 per cent, according to R. H. Gerke of U. S. Rubber, at the March meeting of the A.S.T.M. It is interesting to note that reclaimed rubber sometimes imparts superior qualities to certain types of products.

This Christmas Spirit

It's good for the draftsman, for the executive, for the shop man. In fact, everybody can use it. It's a new all-purpose pocket knife made by Gits Bros., of lubricator fame. Gitsnife is the name when you buy it.

Good News

Heard the other day that one of our largest car makers just took delivery of one of the largest shipments of shapers put out in a long time. Here's hoping Cincinnati shapers keeps up the good work.

Controlling Maintenance

One of the best ways of controlling maintenance expense we have seen in a long time was recently installed in a large parts plant. What they do is to work the payroll like an accordion—shrinking or expanding as needed. The control comes from a forecast of activity each month in advance.

The Book of Metals

Donald Wilhelm wields an eloquent pen in praise of the metallurgist. Many people in the past have said that progress in the automotive industry has hinged on metals and alloys. But this author is one of the few to eulogize the *men* who made the advance possible. Mr. Wilhelm's "The Book of Metals," just published by Harper & Brothers, is a non-technical story of the metals we meet most frequently in our work. It is divided into 17 chapters, each one devoted to the life, habits and peculiarities of some metal. Among the metals covered in the book are: iron, steel, aluminum, zinc, copper, brass, etc. The scientific accuracy of this absorbing tale is vouched for by more than 35 trade associations and outstanding metallurgists. If you are interested in a simply-worded, quick-reading story of the metals used in your products, this book belongs on your 5-ft. shelf. It runs 341 pages and has five page illustrations by Margaret Bourke-White. Price \$4.

Believe It or Not

We learn from "The Book of Metals" that aluminum and nickel are among the few metals which are of comparatively recent origin. That is to say, they were not known in the days of the Pharaohs or the Caesars as is usually the case. In fact, aluminum was born in the crude laboratory of Charles Martin Hall in 1886.

Baking Cores

Industrial Gas News brings word of the successful operation of a combination core-baking and mold-drying oven. Recirculated heat is obtained from a separate gas-fired heater.—J.G.

MANUFACTURING
MANAGEMENT
METALLURGY

March 26, 1932

Metallurgists Join With Press

AT the last annual dinner of the S.A.E. in Detroit, a huge gathering of engineers heard Maurice Holland of the National Research Council say some unkind things about the research activities of the automotive industry. Looking at it from only one angle within the writer's experience, it seems the body industry has a lot to say for itself to anyone interested in the resultfulness of its research program.

Remarkable things are being done with sheet metal. It is stretched as it was never stretched before. It is drawn into forms that would not have been attempted several years ago. Yet the finished stamping is free of draw lines, surface imperfections, etc. Research has produced a better product—at a fraction of past costs.

These improvements come as a result of: 1. cooperative efforts of metallurgists in body plants and sheet

by Joseph Geschelin

mills in studying the behavior of sheet metal; 2. improved presses, capable of higher pressures at much faster speeds; 3. significant advances in die design based on accumulated experience and constant experiment.

Not so long ago, stretcher strains or worms in large stampings were an unexplained phenomenon. Despite the efforts of the press shop, these imperfections appeared in production and demanded either rejection or costly refinishing which was not always satisfactory. Today, most press operations are preceded by a roller-leveling operation giving the sheet the required ductility and grain structure—thus practically eliminating the previous trouble. Again a product of automotive research.

Resistance welding, spot welding, and special forms of automatic gas welding have been developed cooperatively with the welding industry to meet the growing needs of body makers and related sheet metal industries. These have played an important role in the development of all-steel construction and better body structures in general.

Because of this specialization, the body industry has been asked to solve many complex stamping problems along other lines. For example, certain 1932 cars boast some-

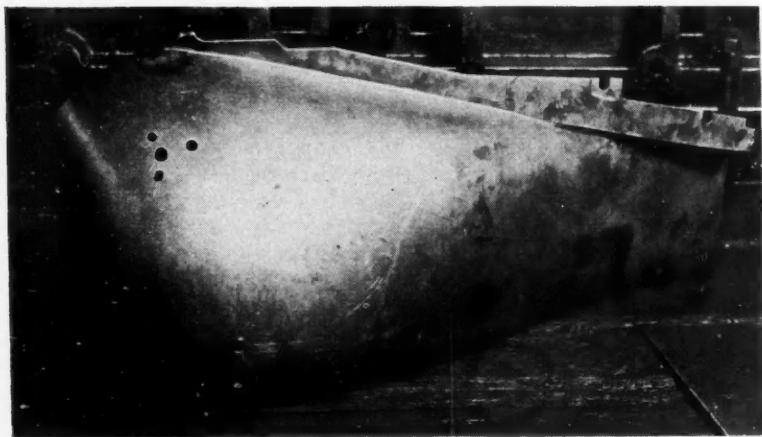


Fig. 1—Budd front fender with hoodledge integral before flash-welding the radiator splasher



Fig. 2—View of triple-action die built for stamping the new front fender design. The success of the operation hinges on the special wedge action at the left

Engineers and Die Designers in Improving Body Sheet Metal Production

thing new in front fenders. These incorporate not only the usual crown and fender skirt but also the hoodledge cover in one stamping, thus simplifying assembly and eliminating squeak-producing joints.

The E. G. Budd Mfg. Co. has just built a new type front fender, as shown in Fig. 1, in which the fender skirt and hoodledge cover are formed from one piece and one-half of the radiator splasher is electrically butt-welded to the skirt. The welded section does not appear in this view.

To accomplish the difficult draw, the dies were built on the car line, with a unique triple action feature as well as a disappearing holding bead in the upper draw-ring. Triple action is accomplished by means of a wedge action, part of which is shown in Fig. 2. It operates in the following manner: After the upper blankholder (draw-ring) has descended on the lower blankholder, holding the blank in position, the punch and wedge descend simultaneously. The wedge raises the floater, Fig. 3, in the lower die forming the lower half of the fenders around the punch at the same moment that the punch reaches the limit of its downward stroke in forming the nose of the fender. That is, the lower part of the fender is really formed around the punch and above the blankholders while it is still inside the upper blankholder. The disappearing holding bead does not start to function until the punch is within two inches of bottom, or finish of the draw, when it engages the blank by means of a wedge action, effecting a reverse draw, or stretch, ironing out all wrinkles.

The cutout in the lower blankholder where the wedge enters and operates the floater also is shown in Fig. 3.

The upper blankholders are made in two parts making it possible to remove the fender skirt side of the blankholder and replace it by another style. Thus two different types of fenders with two kinds of skirts can be formed on the same die. Of course, a new punch and floater are necessary but the saving in the blankholder is quite considerable.

The radiator splasher is formed in duplicate in a single die and is parted by a band saw so that one stamping makes two halves. Each piece is then butt-welded to the fender skirt. The fender is wired and finished by the car maker.

It might be of general interest to mention an important activity of the Murray Corp. of America, for the answer to some vexing questions in the stamping of stainless steel sheets may be found here. Much has been said about the difficulty of drawing stainless steel; about the seeming impossibility of overcoming wrinkle and die marks and other technical considerations such as die materials, die clearances (said to be excessive),

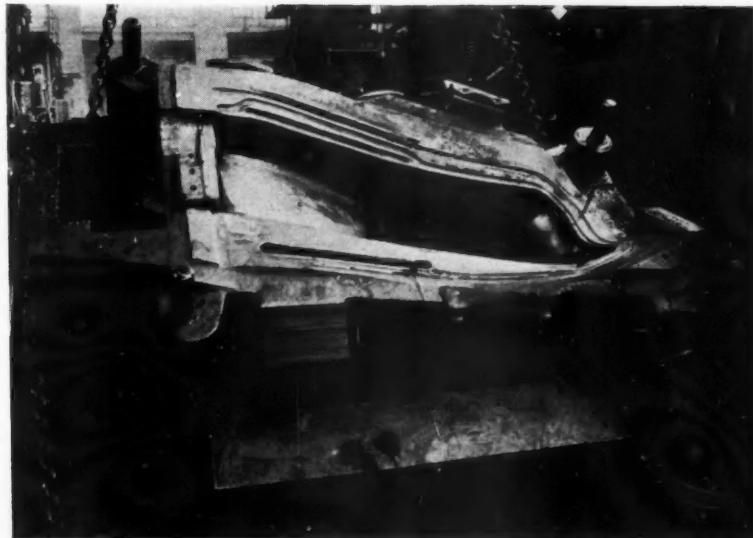


Fig. 3—The operation of the floater is controlled by the wedge action. Wedge enters the blankholder in the cutout shown at the right

etc. It was therefore quite a surprise to the writer to find that these people seem to be all set on stainless steel procedure. The evidence is found in a line of kitchen sinks which certainly have plenty of deep drawing problems.

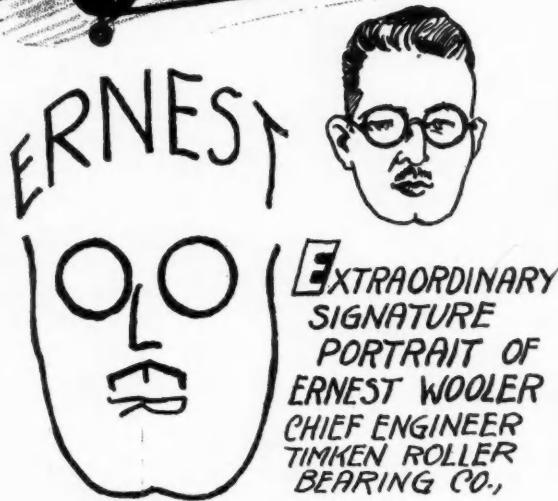
We were particularly impressed with the fact that the surface all around was clean and free of die marks and scratches. Moreover, the sink is welded to the drain board and that's something too. According to the Murray metal expert, the secret of the whole thing lies in the application of sufficient draw-ring pressure. If you are thinking of stainless steel forming you can avail yourself of some of their experience.

This is just one phase of the activity of the sheet metal working industry. But it is typical. In other plants savings will be found in different directions, for this is a highly competitive industry, and individual skill and resourcefulness play an important part. But in every case the effort is directed toward a better product at lower cost.

British Buying Canadian Lumber

AN initial order for 12 carloads of hardwood from Nova Scotia and New Brunswick has been secured for an English motor car manufacturing company, R. W. E. Burnaby, maritime trade commissioner in Toronto, has announced. The representative of a local hardwood company, by which the order was obtained, has left to take up options on this lumber from operators in the two maritime provinces. The consignment will be assembled at the Eastern Car Works, Trenton, N. S., and shipped from Halifax April 16.

Automotive Oddities—By Pete Keenan



Write us if you know an "Oddity"

The NEWS TRAILER

An unobtrusive news item in the daily papers for March 23 records the marriage in San Francisco of Captain Woolf Barnato. Captain Barnato, the news record says, is a son of the celebrated late Barnet Barnato, South African owner of diamond mines, whose stupendous deals were first-page news at the turn of the century.

What the newspapers don't say is this: Captain Barnato, who served in the British artillery during the World War, is one of the most daring racing drivers in Great Britain. He captained the famous Bentley team which competed in the 24-hour races at Brooklands and Le Mons. Prior to the recent sale of the Bentley Works to Rolls-Royce, Captain Barnato was associated with Walter Bentley in the development and promotion of the Bentley 8-liter sports car, which has fired the imagination of those who thrill to speed. Several months ago Captain Barnato came to this country to sound out the possibilities of introducing the Bentley to the United States market directly.

Doubleday, Doran will shortly republish "An Outline of Careers," which is edited by Edward L. Bernays, and contains a chapter on the automobile business by Roy D. Chapin, who has been in it for quite a while. A paragraph by Mr. Chapin in his chapter bears repeating. He says: "The automobile man's day is never done. Once he leaves his work he finds the motor vehicle the subject of general conversation everywhere. There is something daily in the papers regarding it, and he sees the streets and highways full of the product of motor factories. If he is wise, his eyes and ears will always be picking up new points. He will study the trend of the market, how it is affected by the general business situation, by the attitude of the public, and by competition. He will constantly seek to broaden his public contacts that he may know more of what is going on in the world. All his travels will be properly utilized to feel the pulse of public attitude and demand in other sections."

Good when written, good now!—H. H.

NEWS

Urges "Reflation" in Foreign Trade

Smith, of General Motors Exports, Says Debts Must be Revalued

NEW YORK, March 22—The present difficulties in export trade were ably analyzed and possible remedies suggested at the regular monthly meeting of the Overseas Automotive Club held today at the Hotel Pennsylvania in conjunction with the annual get-together of the New York Export Managers Club.

Edgar W. Smith, assistant to James D. Mooney, president of General Motors Export Co. and member of the executive committee of the World Trade League of the United States, and Arvid L. Frank, vice-president and general manager of the Studebaker Pierce-Arrow Export Corp., were the principal speakers.

After presenting a unique picture of the present dilemma in the form of a parable, Mr. Smith pointed to three steps necessary to meet the present situation. In the first place, to stem the present deflation, Mr. Smith advocated "reflation" as contrasted with the "superflation" of three years ago.

Following that, it is necessary to recognize that international debts must, of necessity, be in abeyance. While negating the thought that international debts should be canceled, Mr. Smith pointed out that the whole question should be revalued, that our credit abroad must be regarded more in the light of permanent investment in wealth creating equities abroad. In order to balance international trade, the proceeds from this investment must be reinvested abroad, rather than being imported in gold into this country, Mr. Smith pointed out. In the third place, a general lowering of tariff barriers is essential for the recovery of international trade, and our imports into this country must increase so that our debtor nations can purchase our commodities.

Mr. Frank looked to three factors to result in the ultimate improvement of our market in Europe. In the first

place, he will watch with great interest what develops at Lausanne in July. In the second place, the economic soundness of England is a steady factor throughout the world, for although England will not be a large market for American products for some time to come, sterling still has a great influence over the exchanges of the world. In the third place, the results of the recent election in Germany have proved the political stability of central Europe, and will do much toward improving general confidence abroad.

Leighton Rogers, chief of the Aeronautical Bureau, Bureau of Foreign and Domestic Commerce in Washington, commented upon international air lines as a factor in improving and developing foreign markets.

Protests Report Favoring Tax

NEW YORK, March 22—National Automobile Chamber of Commerce has directed a letter to the United States Chamber of Commerce, protesting the inclusion of a selective sales tax recommendation in the report of its taxation committee.

Alfred Reeves, vice-president of the chamber, in his letter of protest states: "The attitude of our organization consistently has been that we do not believe any one industry should be singled out to bear more than its equal share of the general tax burden when the sole purpose of the discrimination is one of obtaining revenue."

Lycoming Reports Income

NEW YORK, March 22—Lycoming Mfg. Co. reports net income for the year ended Nov. 30, 1931, of \$1,239,815. This is equivalent to \$28.97 a share on common stock, and compares with a deficit for the previous year of \$586,330.

Raybestos Reports Income

NEW YORK, March 22—Raybestos-Manhattan, Inc., reports net income, before dividends, for 1931, of \$553,993. This is exclusive of adjustment for inventories and Canadian exchange.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, March 23—The colder weather last week stimulated the movement of winter goods, but had the opposite effect on spring lines. Wholesale trade continued along conservative lines. The heavy industries continued slow. While the growing optimism in this country has been furthered by the results of the German election and the favorable financial developments in England, there has been no increase in the actual level of trade.

COMMERCIAL FAILURES

Commercial failures in the United States during February, according to R. G. Dun & Co., numbered 2732 as against 2563 a year ago. The liabilities involved in the February failures totaled \$84,900,106, as against \$96,860,205 in January and \$59,607,612 a year ago.

CONSTRUCTION AWARDS

Construction contracts awarded in 37 Eastern States during February, according to the F. W. Dodge Corp., amounted to \$89,045,800, as against \$235,405,100 a year ago. The value of contracts awarded in February was about 5 per cent above that in January, representing the usual seasonal rise.

MERCHANDISE EXPORTS

The value of merchandise exports during February amounted to \$155,000,000, as against \$224,346,000 a year ago, while imports totaled \$131,000,000 as against \$174,946,000.

COTTON CONSUMPTION

Cotton consumed in the United States during February totaled 506,782 bales, including linters, as against 485,578 bales during January and 487,063 bales a year ago.

CRUDE OIL OUTPUT

Average daily crude oil production for the week ended March 12 amounted to 2,145,600 barrels, as against 2,140,850 barrels for the preceding week and 2,190,550 barrels a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended March 19 stood at 63.1, as against 63.3 for the week before and 62.9 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended March 16 were 32 per cent below those a year ago.

STOCK MARKET

The trend of the stock market last week was downward. The recession in prices started with the announcement of the death of two internationally known industrialists. Favorable reports regarding the elections in Germany and the improvement in British finances were considerably disregarded in the tide of liquidation. The trading volume was substantially above that in recent weeks. Weakness in the bond market accompanied the deflation in stock prices.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended March 16 showed decreases of \$87,000,000 in holdings of discounted bills and of \$32,000,000 in holdings of bills bought in the open market. Holdings of Government securities increased \$57,000,000. The reserve ratio on March 16 was 70 per cent, as against 68.8 per cent a week earlier and 68.1 per cent two weeks earlier.

Over a Billion Available for Roads

But This Amount is Considerably Below Last Year's Figure

WASHINGTON, March 23—Funds estimated as available for public road and bridge construction and maintenance in 1932 amount to \$1,353,000,000, according to information collected from road officials by the Bureau of Public Roads, U. S. Department of Agriculture. Of this amount \$882,000,000 is the probable expenditure by state highway departments, and \$471,000,000, it is expected, will be spent by local authorities.

The detailed total of road and bridge expenditures in 1931 is not yet known, but the 1932 program is less by 19 per cent than the total rural road expenditure of \$1,680,000,000 in 1930. Comparing state highway expenditures of \$980,000,000 in 1930 with similar funds available for 1932, there is a decrease of 10 per cent. Similarly there is a decrease of 33 per cent in local funds, the 1930 expenditure having been \$700,000,000.

The state highway funds have declined considerably less than local funds because they are derived in large part from motor vehicle and gasoline taxation and there has been no marked reduction in these revenues. The local road funds also participate in these revenues but not to the same extent.

The total estimated expenditure of the state highway departments of \$882,000,000 is divided as follows: Construction of roads and bridges, \$568,000,000; reconstruction and maintenance, \$197,000,000; interest on highway bonds, \$64,000,000; and miscellaneous \$53,000,000.

The state highway departments plan to construct 36,000 miles of road. This mileage includes 8800 miles of high-type road such as asphalt, concrete, and brick; 17,500 miles of macadam, gravel and sand-clay, and 9000 miles of graded earth. There are also to be constructed approximately 700 miles of road in New York not distributed by types, and the mileage to be constructed in Connecticut and Florida is not included. The state

highway departments will maintain 314,900 miles of road. Similar information concerning local funds and mileage is not available.

The states with state highway programs in excess of \$50,000,000 are listed in order of size of program as follows: Pennsylvania, New York, Illinois, California, New Jersey, Ohio, Texas, Missouri, Michigan.

The local program of road construction will exceed \$25,000,000 in the following states, which are listed in order of size of program: Pennsylvania, New York, California, Ohio, and Illinois.

Wikov Car Built Under Jaray License

The Wikov streamlined automobile recently exhibited at the Prague automobile show and described briefly in *Automotive Industries* for March 12, was built under license to Czechoslovakian patents Nos. 13694 and 17009 held by Messrs. Susman and Jaray, according to a communication received from H. B. Chalmers, president of the Jaray Streamline Corp. of America, New York. The patents cited have broader application than that included in their adaptation to the Wikov car.

Townend Licenses Available for U. S.

The Pratt & Whitney Aircraft Co. has announced that it has now completed arrangements whereby licenses may be granted under the United States and foreign patents owned by Boulton & Paul, Limited, for the use of Townend rings with Pratt & Whitney engines. Licenses may be procured for new engines and for engines already in use.

Bastian Dividend Deferred

CHICAGO, March 21—Directors of Bastian-Blessing Company have deferred payment of quarterly dividend due April 15. January 15 dividend of 25 cents was paid and in the two preceding quarters 50 cents was paid, prior to which regular quarterly payment was 75 cents. This action was taken to preserve cash, company officials stated.

Burney Advocates Canadian Control

Laments Domination of Dominion Industry by U. S. Capital in Talk

TORONTO, March 23—Canadian automobile associations and chambers of commerce should consider the advisability of taking steps at the forthcoming Imperial Economic Conference at Ottawa to secure governmental aid for the automobile industry in both Canada and Great Britain, said Sir Dennistoun Burney, Bart., addressing the Canadian Club here recently.

Sir Dennistoun expressed regret the Canadian motor car industry was dominated by United States capital.

"It seems to me that as long as countries are organized on a national basis, the direction and control of the factories of a major industry should be in the hands of the country's own nationals," he said.

He suggested creation in the British Empire of a free-trade zone with a general basis of taxation throughout to open up to British and Canadian automobile manufacturers motor car markets of the Empire.

Nash Reports Orders Gain

CHICAGO, March 21—March orders for new Nash cars were increased 58.9 per cent in the first 15 days of the month over the orders scheduled on the company's books March 1, C. H. Bliss, vice-president in charge of sales, announced Friday. Unfilled orders for retail delivery have increased 418 per cent since Feb. 27.

Ainsworth Reports Assets

CHICAGO, March 21—Ainsworth Mfg. Co. reports current assets of \$1,743,340 against current liabilities of \$164,191, Dec. 31, 1931, a ratio of 10.5 to 1. At close of 1930 the company had current assets and liabilities respectively of \$2,016,114 and \$120,664.

Changes in Value of Automotive Stocks in the New York Stock Exchange During February

March Bulletin of the N.Y.S.E.

| NAME OF GROUP | COMMON STOCKS | | | | | PREFERRED STOCKS | | | | | ALL STOCKS | | | | |
|---|------------------|---------------|---------------|---------------------|--------------------|------------------|---------------|---------------------|--------------------|---------------|---------------|---------------------|--------------------|--|--|
| | No. of Companies | No. of Issues | Average Price | Total Shares Listed | Total Market Value | No. of Issues | Average Price | Total Shares Listed | Total Market Value | No. of Issues | Average Price | Total Shares Listed | Total Market Value | | |
| Automobile & Truck Mfg. Cos. (and Holding Cos.) | 22 | 22 | \$13.88 | 83,294,456 | \$1,156,397,876 | 7 | \$72.63 | 2,363,475 | \$171,664,455 | 29 | \$15.50 | 85,657,931 | \$1,328,062,331 | | |
| Automobile Access. Mfg. Cos. (and Holding Cos.) | 35 | 35 | 8.67 | 22,238,584 | 192,729,810 | 5 | 25.39 | 297,409 | 7,551,474 | 40 | 8.89 | 22,535,993 | 200,281,281 | | |
| AUTOMOBILE INDUSTRY TOTAL | 57 | 57 | 12.78 | 105,533,040 | 1,349,127,688 | 12 | 67.35 | 2,660,884 | 179,215,929 | 69 | 14.13 | 108,193,924 | 1,528,343,615 | | |
| Petroleum & Natural Gas Cos. | 42 | 44 | 11.92 | 169,259,526 | 2,017,403,706 | 12 | 33.97 | 2,178,815 | 74,013,949 | 56 | 12.20 | 171,438,341 | 2,091,417,655 | | |
| Petroleum & Natural Gas Holding Cos. | 3 | 3 | 4.65 | 3,505,969 | 16,286,285 | | | | | 3 | 4.65 | 3,505,969 | 16,286,285 | | |
| PETROLEUM INDUSTRY TOTAL | 45 | 47 | 11.77 | 172,765,495 | 2,033,689,991 | 12 | 33.97 | 2,178,815 | 74,013,949 | 59 | 12.05 | 174,944,310 | 2,107,703,940 | | |
| AIRPLANES-A'WAYS-A'PORTS TOTAL | 9 | 9 | 5.83 | 16,479,081 | 9,116,087 | 2 | 9.26 | 1,381,359 | 12,790,728 | 11 | 6.10 | 17,860,440 | 108,906,815 | | |
| RUBBER TIRE & GOODS INDUSTRY TOTAL | 8 | 8 | 6.83 | 9,680,098 | 66,137,441 | 10 | 32.90 | 2,656,982 | 87,510,206 | 18 | 12.45 | 12,340,080 | 153,647,647 | | |
| FARM MACHINERY INDUSTRY TOTAL | 7 | 6 | 16.40 | 8,086,516 | 132,600,799 | 5 | 34.28 | 3,144,290 | 107,771,786 | 11 | 21.40 | 11,230,806 | 240,372,585 | | |
| Omnibus Operating Cos. | 3 | 3 | 5.86 | 1,085,289 | 6,363,581 | 1 | 59.50 | 88,830 | 5,285,385 | 4 | 9.92 | 1,174,119 | 11,648,966 | | |

Buick, Olds and Pontiac Destinies Now in Hands of Reuter and Grant



Knudsen becomes Oakland's general manager in addition to duties as head of Chevrolet

NEW YORK, March 24—Buick and Oldsmobile divisions have been consolidated under the general managership of Irving J. Reuter, a vice-president, formerly general manager of the Oakland division and one-time Oldsmobile president, effective April 1.

W. S. Knudsen, in addition to his duties as president and general manager of Chevrolet, assumes the general managership of the Oakland division, and sales of Buick, Pontiac and Oldsmobile have been consolidated under the direction of General Motors Vice-President Richard H. Grant, according to an announcement made March 23 by Alfred P. Sloan, Jr., president of the corporation.

DETROIT, March 24—Greater flexibility in management and operations, improved parts service to the dealer, especially the small dealer, and the means of making available the maintenance of a stronger sales organization are involved in the formation by the General Motors Corp. of the Buick-Olds-Pontiac Sales Co., as a result of the merger of merchandising efforts of these three divisions. This is the view of R. H. Grant, who, in addition to his duties as vice-president of the parent corporation, will also be head of the new organization.

Assisting Mr. Grant will be W. A. Blees, formerly vice-president in charge of sales of the Oakland Motor Car Co., as general sales manager of the new company, George H. Wallace and R. K. White as assistant sales managers of the new company. Mr. Wallace formerly was assistant sales manager of Buick and Mr. White assistant sales manager of Oakland. D. S. Eddins, newly elected president of Olds Motor Works, joins Mr. Grant's staff.

Home offices of the Buick-Olds-Pontiac Sales Co. will be in the General Motors Building in Detroit. There will be four regional offices located in New York, Chicago, Atlanta and San Francisco and a total of about 30 zone offices.

The new company is set up on a basis similar to that of the South East Sales Co.,* organized recently in the South-eastern states and handling the sales of all General Motors'

*Page 999, Dec. 26, 1931, and page 25, Jan. 2, 1932, *Automotive Industries*.

(Turn to page 503, please)



Irving J. Reuter, G. M. vice-president, who leaves Oakland to head Buick and Oldsmobile as manager of the new Buick-Olds consolidation plan

Richard H. Grant, G. M. vice-president, who is president of the new Buick-Olds-Pontiac Sales Co.

Price Test Due on Heavy Items

Ford Continues to Withhold Orders for Iron Ores

NEW YORK, March 24—Approach of the year's second quarter is bringing some inquiries to steel mills and in the heavy-rolled products there is likely to be an early showdown as to the validity of the 1.60 cents, Pittsburgh, price which has been quoted lately while actual shipments have carried an invoice price of approximately 1.50 cents. The "stabilized" prices for the lighter rolled products, sheets, strip, etc., are not likely to have much of a test until volume of demand turns more decidedly upward and for this very reason developments in the steel bar market are being watched closely for their possible effect on other descriptions of finished steel.

Postponement of the Ford Motor Company's inquiries for iron ore quotations, usually the signal for the season's opening in the iron ore trade, caused further disappointment. Iron ore mining companies and sales agencies are reconciled to light demand in 1932, nearly all furnaces having large reserves in their yards and extraordinarily low scrap prices making further inroads into their market, but they had looked for an earlier start in the curtailed buying program than now appears in sight. While individual orders for automotive alloy steels run light in quantities, aggregate volume of demand is at least on a parity with that for steel products generally and prices hold steady. The same may be said of cold-finished steel bars.

Pig Iron—Foundry and malleable iron has been reduced 50c a ton by Cleveland district furnaces as the result of intensive competition from Valley and Pittsburgh

district producers in Middle West markets. Automotive foundries are taking in iron as they need it for melting and keeping their stocks very low. Labor disturbances in the mining regions have had little effect on the coke market so far, the price for foundry coke remaining at \$3 @ \$3.50, Connellsburg, and \$3.00 per ton, Detroit ovens.

Aluminum—Middle West specialists in secondary metal report fair demand from the smaller foundries in the automotive accessories field. The primary market continues dull and unchanged.

Copper—Some consumers are taking advantage of the attractive price at which the metal is now selling—6c, delivered Connecticut Valley—and gradually covering their requirements for third quarter and even so long ahead as the remainder of the year.

Tin—Weakness in London was reflected in the week's opening quotation of 21 1/4c for prompt Straits.

Lead—Dull and easy.

Zinc—Quiet and easy.

Reynolds Concentrating at Jackson Plant

DETROIT, March 22—Production of Reynolds Spring Company is being concentrated in the Jackson, Michigan, plant, according to E. W. McIntosh, vice-president. It is expected that the move, which will be completed by April 1, is temporary pending revival of business to warrant reopening of the Detroit factory. The company has reported net loss of \$195,107 after all charges for year ended Dec. 31, 1931, compared with net loss of \$181,522 in 1930.

Libbey-Owens Reports Loss

NEW YORK, March 21—Libbey-Owens-Ford Glass Co. reports net loss for 1931 of \$1,098,195, after all charges. Operating profit for the year was \$3,040,488.

United Aircraft Has Profit

NEW YORK, March 21—United Aircraft & Transport Corp. and subsidiaries report consolidated net in-

come for the year 1931 of \$2,187,548. This is equivalent to \$1.04 a share on common stock. Current assets as of Dec. 31 are \$3,249,464.

National Supply Reports Loss

CHICAGO, March 21—The National Supply Co. of Delaware and subsidiaries reports a consolidated net loss of \$4,495,796 for the fiscal year ending Dec. 31, 1931. The earned surplus of the company dropped from \$18,419,382 to \$10,500,893 during the year, but reserves against maintenance, depreciation, etc., were substantially increased, according to the annual report. The company, whose subsidiaries include the Otto Engine Works, Philadelphia, and the Superior Engine Co., Springfield, Ohio, has under development a completely new line of Diesel engines for commercial and marine applications, the report says.

School Gets Plymouth Engine

DETROIT, March 21—Officials of the Plymouth Motor Co. have donated a complete Plymouth engine to the automotive laboratories of Cass Technical High School.

Twin Coach Reports Profit

NEW YORK, March 22—Twin Coach Company reports net profit for 1931 of \$384,798, as compared with a loss for the previous year of \$109,514.

Crude Rubber Low Again

NEW YORK, March 22—A new record low price for crude rubber was established on the Rubber Exchange for New York this week when goods for March delivery sold for 3.01 cents a pound.

Monthly Estimates of Motor-Vehicle Stocks Abroad at End of January, 1932

WASHINGTON, March 21—The following information, based upon data obtained from the most reliable sources, is supplied by the foreign offices of the Bureau of Foreign and Domestic Commerce. Every care is used

in the preparation of the estimates which are made only after careful investigation. "High" means that the supply is considered large in relation to current state of demand. "Normal" is used almost synonymously with

"adequate," that is, when the volume on hand is sufficient to supply immediate requirements plus the estimated demand for 1 to 1 1/2 months. "Low" means volume on hand is not sufficient to supply immediate requirements.

| Country | PASSENGER CARS | | | | TRUCKS AND BUSES | | | | | | | |
|----------------------|----------------|-----------------|-----------------|-----------------|------------------|-----------------|--------------------|-------|----------------|-------------------|----------------|-------------------|
| | Low U. S. | Priced Other | Medium U. S. | Priced Other | High U. S. | Priced Other | Used Cars U. S. | Other | Heavy U. S. | Capacity Other | Light U. S. | Capacity Other |
| Australia | U-H | H | H | N | H | N | L | L | H | L | H | L |
| New Zealand | L | N | L | N | L | N | N | N | N | N | L | L |
| Czechoslovakia | U-L | S-H | L | N | N | H | N | U-H | N | H | N | N |
| Denmark | N | N | N | N | H | N | N | N | N | N | N | N |
| Greece | N | H | N | U-H | L-L | H | N | N | L | L | N | N |
| France | N | U-H | N | U-H | L-L | H | H | H | NONE | H | N | L |
| Netherlands | N | N | N | L | H | N | L | U-L | L | L | N | N |
| Poland | L | L | L | L | L | L | H | H | L | L | L | L |
| Portugal | L | L | L | N | U-L | U-L | H | H | L | L | N | N |
| Rumania | L | L | S-L | N | N | N | U-H | N | L | L | N | N |
| Spain | L | L | U-L | U-L | U-L | U-L | U-L | U-L | U-L | U-L | U-L | L |
| Sweden | LL | — | L | — | L | — | N | N | L | — | N | N |
| United Kingdom | NN | H | N | N | N | H | L | H | — | — | L | N |
| Norway | N | NN | N | L | L | L | H | H | L | L | N | N |
| Turkey | N | NN | N | NONE | NONE | NONE | N | N | N | NONE | H | N |
| Hungary | N | N | H | N | N | N | N | N | N | N | L | H |

H-High L-Low N-Normal U-Unusually S-Seasonally —No information forwarded

Tire Companies Report

AKRON, O., March 21—The Master Tire and Rubber Corporation, a consolidation of the Falls Rubber Co. of Cuyahoga Falls; the Cooper Corporation of Findlay and the Giant Tire Co. of Findlay, Ohio, has reported a net profit for 1931 of \$110,420, after all depreciations were written off—enough to cover all preferred dividends and leave a small amount of earnings on common stocks of the consolidated company.

Current assets of the company were listed as \$1,063,663, and current liabilities at \$438,291 by R. P. Bremer, president of the Company. The consolidated company has been in operation a year and has pioneered in new designs in tires, featuring white and checkered sidewalls for sport model cars. All officers were reelected at the annual meeting in the offices at Cuyahoga Falls, Akron suburb.

Petroleum Imports Down

NEW YORK, March 23—Imports of petroleum at the principal ports of the United States for the week ended March 19 have been estimated by the American Petroleum Institute at 231,571 bbl. daily. This compares with the daily average of 307,429 bbl. for the week ended March 12, and with 269,286 bbl. for the four weeks ended March 19.

Crude runs to stills during the week are placed at 2,085,000 bbl. daily. Cracked gasoline produced during the week was placed at 2,889,000 bbl.

Stocks of gasoline at bulk terminals and in transit, east of California, for the week ended March 19, totaled 14,129,000 gal., as compared with 13,833,000 gal. for the previous week, and with 13,672,000 gal. for the week ended March 21, 1931.

Dodge Names Burke

Announcement has been made of the appointment of J. D. Burke as truck sales manager of Dodge Brothers Corp. Mr. Burke, who has been connected with various divisions of Chrysler Corp., including Chrysler Sales and Fargo, recently has been regional truck representative in New York.

He succeeds W. S. Graves, who remains with the organization but in a capacity the functions of which have not as yet been announced.

Autocar Personnel Shifted

H. M. Coale, vice-president in charge of sales of the Autocar Co., Ardmore, Pa., has announced the transfer of H. L. White, from the management of the Autocar branch in Pittsburgh, to Philadelphia, where he will assume charge of the sales in the "outside" territory of the Autocar Philadelphia district, with headquarters at the

Philadelphia branch, succeeding A. M. Bates, who is being transferred to the national-accounts division in New York, where he will be a salesman under the supervision of C. E. Dwyer.

W. W. Smith is being transferred from the Autocar branch in Detroit, succeeding Mr. White at Pittsburgh, and D. M. Murray, who has previously been connected with the Autocar sales organization in Detroit, will succeed Mr. Smith at that point as branch manager.

Announcement is also made of the appointment of J. O. Warner to the management of the Autocar branch in St. Louis. Mr. Warner is a newcomer to the Autocar organization, but has previously had experience in the branch management and sale of trucks, especially in the St. Louis area, for both the Indiana and the Federal companies.

John T. Clancy

NEW YORK, March 21—John T. Clancy, since 1923 assistant manager of gas and oil engine sales for the Worthington Pump and Machinery Corp., died suddenly March 9, while lecturing at the Engineers Club in New York. Mr. Clancy had been with Worthington since 1929, joining the company after a war experience as captain of field artillery. For the last few months his headquarters had been at the Harrison (N. J.) plant of Worthington.

Opel and Steyr Negotiate

According to *Automobiltechnische Zeitschrift*, negotiations are being conducted at present between the Steyr Works of Austria and the Opel of General Motors Corporation with respect to a plan for assembling the small Opel car at the Steyr Works from parts imported from Germany under specially favorable terms.

Link-Belt Elects Torrence

George P. Torrence, formerly vice-president in charge of the Indianapolis operations of the Link-Belt Co., has been elected president of the company. Mr. Torrence has been in the employ of the Link-Belt Co. since 1911.

Alfredo Maserati

Signor Alfredo Maserati, whose sports and racing cars were well-known on the more important European tracks and circuits, died recently at the age of 45 years.

Federal Reports Loss

DETROIT, March 24—Federal Motor Truck Co. reports net loss for last year of \$461,830 after all charges against net profit previous year of \$153,219.

Grant Heads Triple G.M. Sales Merger

(Continued from page 501)

divisions in its territory with the exception of Chevrolet and General Motors Truck. Franchises for dealers will be issued and dealer contracts made with the new subsidiary, rather than with the individual manufacturing and sales divisions merged into it. Sales of parts will be handled by the central company according to a set-up similar to that in the Southeast. Meetings and a series of conferences have been arranged for and will be held with all dealers concerned in the near future, according to Mr. Grant, to acquaint them with the details of the new organization. It is interesting to note, however, that while car sales and parts sales to dealers and dealers' contacts will be handled by the central organization, each make of car will receive individualized attention so far as merchandising help, such as advertising, is concerned.

"We hope," Mr. Grant stated, "that the establishment and maintenance of a stronger sales organization when united instead of split up in three separate divisions will produce sales of more automobiles and increased profits to dealers."

Plans Tax Effort

NEW YORK, March 23—In view of recent developments with regard to the manufacturers' sales tax recommendations in Washington, the Motor and Equipment Manufacturing Association has called upon its members to write their congressmen reiterating the stand of the industry that any effort to raise additional revenues by the government in the way of sales tax should be general and not directed against certain industries.

Graham Production Up

DETROIT, March 24—Graham Paige reports that eight-cylinder production since Jan. 1 exceeds its total production of eights in any one entire year. At close of week the total will be 6080 against 5622, which is the best previous 12 months' record. Including December production 7200 new eights have been built.

Gear Assn. Office Moved

The office of the American Gear Manufacturers Association has been moved from 3608 Euclid Ave., Cleveland, to the Ninth-Vincent Bldg. in the same city, according to an announcement from T. W. Owen, secretary.

Legge Goes to Europe

NEW YORK, March 24—Alexander Legge, president of the International Harvester Co., sailed today aboard the liner Bremen for Europe.

British Facts and Figures for 1931

Courtesy The Motor Trader, London

| BRITISH MOTOR INDUSTRY | 1931 | 1930 |
|---|---------------------------------|-------------|
| BRITISH PRODUCTION | | |
| Cars and Chassis | 160,460 | 167,287 |
| Commercial Vehicles and Chassis | 67,816 | 68,039 |
| Total | 228,276 | 235,326 |
| Estimated Value: Cars and Chassis | £39,618,685 | £41,821,750 |
| Commercial Vehicles, etc. | £25,691,250 | £30,617,550 |
| Average Retail Price: Cars | £246 | £250 |
| Goods Vehicles | £378 | £450 |
| TOTAL HOME SALES | | |
| Cars Registered for first time (Great Britain only) | *141,392 | †153,655 |
| Saloons | 130,076 | 135,375 |
| Touring | 11,176 | 18,084 |
| Cars (Northern Ireland) | 2,820 | 2,815 |
| Goods Vehicles (Great Britain only) | 59,888 | 61,516 |
| Trucks | 51,412 | 51,878 |
| Hackneys | 8,476 | 9,638 |
| Goods (Northern Ireland) | 1,125 | 1,093 |
| BRITISH SALES ABROAD | | |
| Cars Exported (Jan.-Dec., 1931) | 17,104 | 19,226 |
| Car Chassis Exported | 1,888 | 3,984 |
| Commercial Vehicles | 2,023 | 3,486 |
| Commercial Chassis | 3,297 | 3,057 |
| Parts and Accessories | value £1,899,835 | £2,171,512 |
| Tires (Covers, Tubes and Solids) | value £3,236,684 | £4,475,122 |
| Total Value British Exports (less Tires) | value £6,357,688 | £8,792,644 |
| IN USE IN GREAT BRITAIN | | |
| Total Cars Registered, Sept. 30, 1931 | 1,083,457 | 1,056,214 |
| Total Commercial Vehicles | 429,942 | 440,070 |
| Goods | 352,478 | 338,939 |
| Hackneys | 87,464 | 101,131 |
| Total Cars and Commercial Vehicles | 1,523,399 | 1,496,284 |
| MISCELLANEOUS STATISTICS | | |
| Taxation from Motor Vehicles | £27,378,028 | £27,040,384 |
| Number of Trade Plates | 18,485 | 19,863 |
| General Plates | 4,476 | 4,472 |
| Limited Plates | 14,009 | 15,391 |
| Number of Driving Licenses | 2,738,000 | 2,810,000 |
| Average Car License | £13 17 6 | £13 18 6 |
| Average Goods License | £25 13 0 | £26 5 6 |
| Average Hackney License | £48 10 0 | £47 11 0 |
| IMPORTS (Jan.-Dec., 1931) | | |
| Cars | 2,160 | 7,680 |
| Car Chassis | 970 | 3,014 |
| Commercial Vehicles | 58 | 58 |
| Commercial Vehicle Chassis | 1,521 | 1,628 |
| Parts and Accessories | value £2,324,496 | £3,505,223 |
| Tires: Covers | value £219,776 | £328,670 |
| Tubes | value £75,106 | £63,457 |
| Solid | value £43,517 | £41,908 |
| Total Value of Imports | (including Tractors) £3,523,012 | £6,006,031 |
| Total Motor Imports (less Tires) | value £3,184,613 | £5,571,996 |
| Petrol | gallons 906,492,264 | 954,609,176 |
| Petrol | value £13,690,816 | £25,930,067 |

*Includes 134 miscellaneous and 6 electric vehicles.

†Includes 181 miscellaneous and 15 electric vehicles.

Census Sets February Production at 117,413

WASHINGTON, March 23—The output of motor vehicles in the United States in February declined to 117,413 units from 119,344 in January, according to reports received by the Bureau of the Census. The February production consisted of 94,085 passenger cars, 23,303 trucks and 25 taxicabs.

Canadian output in February totaled 5,477 motor vehicles, an increase from 3,731 in January. The February output was comprised of 4,494 passenger cars and 983 trucks.

Dayton-Allis Suit Settled

DAYTON, OHIO, March 23—Notice is being sent out by the Dayton Rubber Manufacturing Company of Dayton, Ohio, and the Allis-Chalmers Manufacturing Company of Milwau-

kee, Wis., that the suit of the Dayton Rubber Manufacturing Co. against Allis-Chalmers Mfg. Co. in United States District Court in the 6th Circuit at Cincinnati, involving patent infringement of Allis-Chalmers' Geist Patent No. 1,662,511, pertaining to Multiple V-Belt Drives, has been settled out of court by the contending parties effecting a mutually satisfactory commercial working arrangement, under which Dayton takes a license under the Geist Patent No. 1,662,511, and Allis-Chalmers can operate under the Short Patent No. 1,538,303.

British Airports Counted

Licensed municipal airports in Great Britain numbered 12 at the end of 1931, according to a report of the Air Ministry. Fourteen other municipalities had reserved airport sites in their plans, and 83 towns had sites inspected.

March 26, 1932

World Trade League Holds First Meeting

NEW YORK, March 22—Upward of 1,000 persons interested in America's export and import trade met last evening at the Hotel Astor under the auspices of the World Trade League of the United States.

Speakers of the evening were V. A. Dodge, of Dodge & Seymour, toastmaster; George F. Bauer, chairman of the Executive Committee of the League; Stephen P. Duggan, director of the Institute of International Education; David J. Elmore, New York representative of the Willys Export Corp., and V. A. Van der Linde, commercial counselor for the *New York Times*.

It was pointed out that although only about 10 per cent of our commercial production goes into export, a much larger portion of the wealth of the country is affected indirectly by our foreign trade. The rapidly growing policy of prohibitive tariff walls being adopted by so many countries today is resulting in a stoppage of the flow of international traffic and the stagnation of domestic interests in all countries. In order to meet this situation, the League proposes that the United States enter into bargaining tariff agreements with the various other countries in which there would be a remission on our part of some of the duties levied against their products in return for a similar concession on their part.

U. S. Rubber Forms Company

NEW YORK, March 23—United States Rubber Co. has formed a new company to be known as the Latex Fiber Industries, Inc., jointly owned by United States Rubber and the J. P. Lewis Co. of Beaver Falls, New York.

Products now manufactured by the Fiber Products Division of the United States Rubber Co. at Cleveland, Ohio, and Rock City Falls, New York, will be produced by the new company at Beaver Falls, in the Lewis, Slocum and LeFevre Co. plant which has been acquired for that purpose, and will be in production by June 1.

Officers of the new company are Harry S. Lewis, president; R. P. Rose, vice-president; Wilson H. Blackwell, treasurer, and E. E. Griffith, secretary.

G. M. May Buy Packard Electric

NEW YORK, March 23—General Motors Corp. and Packard Electric Co. have entered into negotiations looking toward the acquisition of the Packard Company by General Motors. While complete details as to terms have not been divulged, it is understood that General Motors is offering one share of its stock for each three shares of Packard Electric stock. The sale now awaits confirmation.

Automotive Industries

G. M. Arranges Its Biggest Exhibition

Program Includes Simultaneous Showing in 55 U. S. Cities

DETROIT, March 24—General Motors will overnight become the world's largest showman with the inauguration on April 2 of simultaneous exhibition of all the corporation's products in the great exhibition halls of 55 American cities. The exhibits will be continued for a week, and are regarded by the corporation as being favorable to the stimulation of general business as well as the sale of the corporation's products. Many hundreds were employed in preparing for the program, and hundreds more will be employed in taking care of the various exhibition details. No admission will be charged to the exhibits and it is hoped to reach a total trading population of 77,000,000 persons through them.

The latest body types of the Cadillac V-16, V-12 and V-8 of LaSalles, the Buick Eights, Oldsmobile eights and sixes, Pontiac V-eights and sixes and Chevrolet Sixes will be displayed at all 55 exhibits. In the larger centers and where exhibition space permits, a representative line of General Motors and Chevrolet trucks also will be exhibited.

A line of AC automotive products, including spark plugs, spark plug testers, oil filters, Remo chemical injector, engine decarbonizers and reflex lamps will be exhibited, as will Delco generators, electric fans and vacuum cleaners. A comprehensive line of Frigidaire electric refrigeration units, both household and commercial, also will be displayed. The Fisher Body Craftsman's Guild will have boy members at work on model Napoleonic coaches at each exhibit, and GMAC also will be represented.

Famous orchestras have been engaged to furnish musical programs afternoon and evening at the exhibits and special programs have been arranged for each individual city where an exhibit is to be held.

The decorative scheme has been designed by leading artists in this craft and will be the same at each of the 55 exhibits. Green and gold will be the color motif, carried out through pleated wall curtains of gold cloth and duvetyn velvet.

Two huge hands 15 ft. high will flank each entrance, and on these will be emblazoned the slogan of the exhibit—"Work for Many Hands." The widespread activities of General Motors which require raw materials from every state in the nation will be graphically pictured on these hands. Opposite the entrances will be a mammoth figure of a giant holding aloft an automobile to symbolize the para-

mount position held by the motor car in American industry.

The preparation of the decorations for the exhibits has in itself been a stupendous task. The exhibits will cover more than a million square feet of floor space and to properly decorate this huge aggregate area more than 50,000 yd. of duvetyn velvet, 30,000 sq. ft. of gold cloth and 30,000 sq. ft. of other decorative fabric is required. The order for the velvet was greater than the existing stock and required special manufacture in the mills to fill the requirement.

All of the 55 auditoriums where the exhibitions will be held will be decorated in the same manner, insofar as the varying size of the halls permit. To accomplish this, the entire order for all the decorations was placed in the hands of one firm after the motif had been decided upon and the details worked out by artists and craftsmen.

All this material was assembled and crated as it was completed. Warehouse space of no mean size was required to store these containers—570 in number—prior to shipment to the exhibition cities. So complete has been the plans and the preparation of this material that comparatively little work is required in setting up the decorations—a task that now is being accomplished in each of the following 55 cities:

Boston and Springfield, Mass.; New Haven, Conn.; New York City, Brooklyn, Albany, Syracuse, Rochester and Buffalo, N. Y.; Charlotte, N. C.; Nashville and Memphis, Tenn.; Atlanta, Ga.; Birmingham, Ala.; Jacksonville, Fla.; New Orleans, La.; Newark, N. J.; Philadelphia and Pittsburgh, Pa.; Baltimore, Md.; Washington, D. C.; Columbus, Cincinnati, Dayton, Cleveland and Toledo, Ohio; Charleston, W. Va.; Louisville, Ky.; Indianapolis, Ind.; Milwaukee, Wis.; Minneapolis and St. Paul, Minn.; Omaha, Neb.; Des Moines and Davenport, Iowa; Kansas City and St. Louis, Mo.; Detroit and Grand Rapids, Mich.; Chicago, Ill.; San Francisco, Oakland and Los Angeles, Calif.; Portland, Ore.; Seattle and Spokane, Wash.; Butte and Billings, Mont.; Dallas, El Paso, Houston and San Antonio, Tex.; Tulsa and Oklahoma City, Okla., and Denver, Colo.

Bendix Profit Increases

NEW YORK, March 24—Bendix Aviation Corp. and subsidiaries show a profit for 1931 of \$1,555,478. This is equivalent to 74 cents a share and compares with earnings of \$1,183,860 or 56 cents a share in the previous year.

Hudson Sales Up

DETROIT, March 24—Hudson-Essex retail sales in the United States and Canada for the week ending March 19 show 20 per cent increase over the previous week.

Long-Speed Marks Climb in France

Kaye Don et al. Push Delage to 117.80 m.p.h. Average

A new group of world's speed records for long distances was established at the Monthlery track, in France, on Feb. 28-29, 1932, when Kaye Don and a team of well-known relief drivers drove an eight-cylinder Delage over 500 kilometers for an average speed of 117.80 m.p.h. The car's engine had a bore of 77 cm. and stroke of 109 cm. with a total piston displacement of 4060 cu. cm. The trial cars were sponsored by Kaye Don. The group of world's records was established for the following distance and times:

WORLD'S RECORDS

| | M.P.H. |
|------------|--------|
| 500 kil. | 117.80 |
| 1,000 kil. | 117.01 |
| 1,000 mil. | 116.36 |
| 2,000 kil. | 116.08 |
| 3 hr. | 117.83 |
| 6 hr. | 117.12 |
| | 117.12 |

The same cars which established the world's records established Class C records as follows, according to the official gazette of the Association Internationale des Automobile-Clubs Reconus:

CLASS C RECORDS

| | M.P.H. |
|------------|--------|
| 200 mil. | 117.47 |
| 500 kil. | 117.80 |
| 500 mil. | 116.73 |
| 1,000 kil. | 117.01 |
| 1,000 mil. | 116.36 |
| 2,000 kil. | 116.08 |
| 3 hr. | 117.83 |
| 6 hr. | 117.12 |
| 12 hr. | 112.09 |

Drivers who participated in the records, in addition to Kaye Don, were G. E. T. Eyston, who recently established a new series of records for baby cars, Eldridge, Fretter, and Denly.

C. I. T. Corp. Names Two

Arthur O. Dietz has been appointed president of the New York operating subsidiaries of the Commercial Investment Trust Corp. and Frank W. Collins has been named president of the Chicago subsidiaries of the Corporation, according to an announcement from Henry W. Ittleson, who is president of the parent company and chairman of the subsidiary groups involved.

Rockne Signs More Dealers

DETROIT, March 21—Exactly 200 more automobile dealers in the United States have joined the retail sales organization of the Rockne Motors Corp. within the last 23 days, making a total of 1200 in less than four months after the first sales agreement was received, according to Frank L. Wiethoff, Rockne sales manager.

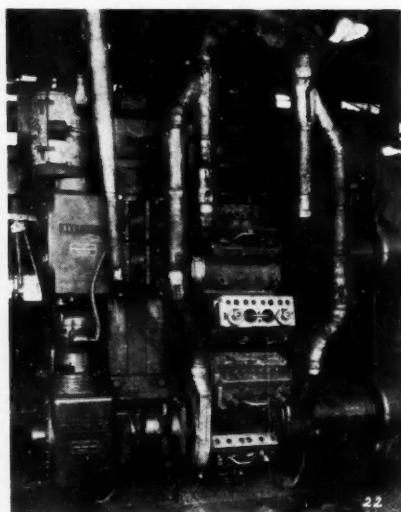
In addition to the 1200 domestic dealers, Rockne also has approximately 110 Canadian and 200 foreign dealers.

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

"Fitchburg" Milling Machines

The Fitchburg Engineering Corp., Fitchburg, Mass., has recently placed on the market a milling head with self-contained power unit which may be operated in any required position, thus reducing the mechanical difficulties in producing special production milling machines to meet all requirements for production milling. This milling head is shown, and can be arranged for permanent mounting or placed on suitably gibbed slide surfaces so they can be adjusted or fed



22

along their supporting member as required. The spindle and spindle drive member are mounted in precision Timken bearings. Drive of spindle is by a chilled phosphor bronze worm wheel engaging a hardened and ground steel worm. Spindle speed is varied by means of pickoff gears.

The illustration shows how two Fitchburg milling heads have been applied to a machine in an automobile plant in Detroit. This made it possible to modify an expensive machine to take care of certain changes in the design of the castings. Without interference with the rest of the machine, it was possible to make the changes required.

Thus the Fitchburg company is in a position to furnish complete milling machines to meet all special requirements, or to supply heads and feed mechanisms for converting existing milling machines.

Adds New Gear Reduction Unit

Foote Bros. Gear & Machine Co., Chicago, has announced an addition to its series of "Hygrade" Worm Gear Speed Reducers, designed to transmit up to 14 hp. continuous duty, this capacity depending on driving shaft speed and the reduction ratio.

The new unit is designated size 5-HG and fills a gap between sizes 4-HG and 6-HG which in special cases could not be met economically by use of either of these last mentioned units. Like the other sizes in this line, the new reducer will be built in five types, HGS—having worm at bottom, HGT—with worm on top, HGV—with worm gear shaft vertical, HGX—consisting of worm reducer with helical attachment, and HGD—having double worm and worm gear reduction. A wide range of ratios is available, varying from 3.5 to 1 to 3000 to 1.

Cutler-Hammer Welding Timer

A new timing device for spot, projection and other forms of resistance welders has been developed by Cutler-Hammer, Inc., Milwaukee, Wis. The manufacturer claims extremely accurate timing control of the welding operation through the use of an electronic tube, which has a range from a fraction of a second to 16 seconds.

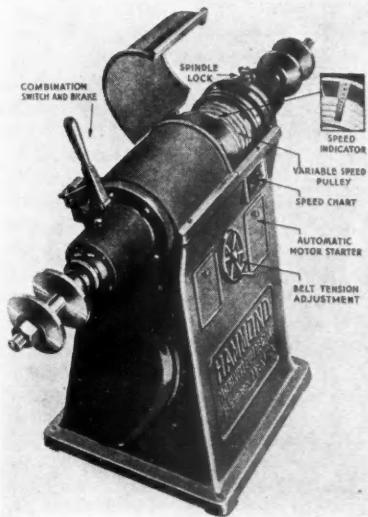
This new control requires a very small mounting space and operates on 110 to 550 volts A.C., 25 to 60 cycles. Vibration, severe or intermittent service will not affect the accuracy of this control, the manufacturer asserts.

Hammond Polishing and Buffing Lathe

The economies made possible by a great range in operating speed permitting buffing wheels to wear down from maximum to scrap size are said to be realized by the new variable speed polishing and buffing lathe developed by the Hammond Machinery Builders, Inc., Kalamazoo, Mich.

Any speed within 50 per cent increase of the low speed may be had by a rapid adjustment. Speed can be increased or decreased 25 revolutions at a time if desired. Greater range can be had by using the variable speed pulley on the motor in addition to one on the spindle, or by changing to another size pulley on motor. The stand-

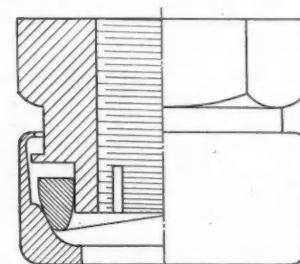
ard machine uses a solid sheave on the motor with a variable speed pulley on the spindle. The desired speed is obtained by expanding or contracting the variable speed pulley to vernier scale letter and corresponding speed figure on speed chart directly in front of operator.



These machines incorporate the same general features as the Rite-speed electric polishing and buffing lathe, made by this company, including extra heavy one-piece ground spindle; automatic motor starter with overload protection, combination switch and brake; four oversize ball bearings protected from dirt and grit by means of labyrinth seals. Made in sizes 3, 5, 7½ and 10 hp. capacity. Single spindle as shown, also two spindle type with independent spindle control.

Dalwa Self-Locking Wheel Nut

A self-locking nut for use more particularly on the hub bolts of motor truck wheels and the retaining studs of demountable wheels is being marketed by the International Safety Lock Nut Corp., 67 Broad Street, New York, N. Y. A sectioned view of the



nut is shown herewith, from which it will be seen that it consists of three parts, the nut proper, an elastic compensator and a cap. When the nut is applied to the stud or bolt, the cap goes on first. It will be seen that the cap-end of the nut proper is saw slot-

(Turn to page 508, please)

YOUR
Sales Department
NEEDS

in this year —

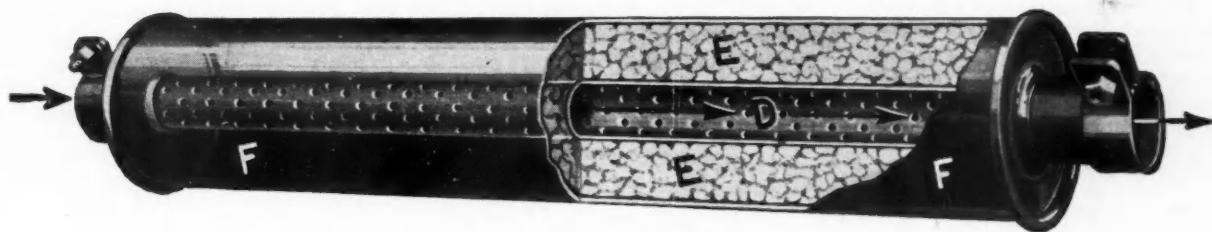
When the Future Sale Supremacy of Many Cars Will Be Decided

The Extra Advantages
Offered Exclusively By

BURGESS

“Straight-Thru” Mufflers and Intake Silencers:

Quieter—Reduced Back-Pressure—No Power Loss—More Speed



As illustrated above, the Burgess Muffler consists of three principal parts: a straight open perforated pipe, D, surrounded by a sound-absorbing material, E, which is enclosed in a metal covering, F. The exhaust gases from the engine pass straight through the perforated pipe, D, but the exhaust noises are absorbed, assuring satisfactory muffling.

BURGESS
BATTERY COMPANY

ACOUSTIC DIVISION, MADISON, WISCONSIN
DETROIT ADDRESS: 542 NEW CENTER BUILDING

ENGINEERS AND MANUFACTURERS OF ELECTRIC AND ACOUSTIC PRODUCTS

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

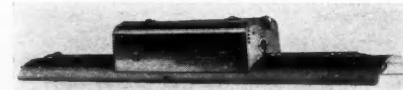
ted, and the slotted portion is surrounded by the elastic compensator, which latter is of triangular section and has a conical outer surface, which contacts with a corresponding conical surface on the inside of the cap. As the nut is screwed home against the hub flange or wheel disk, the cap is forced down upon the compensator, compressing it, which in turn forces the slotted portion of the nut proper down upon the stud, securely locking it in place.

The cap, compensator and nut are assembled so that they can be handled as a single unit. The operation of mounting and tightening up the nut on its stud is exactly the same as the corresponding operation with the ordinary nut, but it is said to assure a positive locking effect. The nut can be readily removed with a wrench, and it can be taken off and replaced any number of times without injuring the threads.

Improved Mercury-Vapor Lamp

An improved Cooper Hewitt mercury-vapor lamp for industrial use has been placed on the market by the General Electric Vapor Lamp Co., Hoboken, N. J. A general summary of the new model includes the following:

Improvements in tube design and performance; simplified reflector equipment; simpler and more rugged auxiliary equipment and electrical features embodying the latest requirements of the Underwriters' Laboratories.



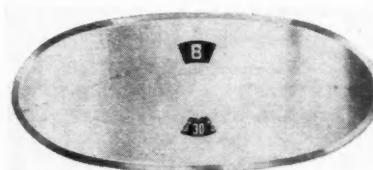
Externally the unit has been greatly improved by the refinement of lines. Sharp corners have been eliminated and the general mechanical appearance vastly improved. Enclosed wiring and new finish place the lamp on a par with the best in electrical equipment.

The new model includes the latest electrical circuits for the starting of Cooper Hewitt Lamps. Recent invention has resulted in more uniform and faster starting than ever before obtained with Cooper Hewitt Lamps. Starting is accomplished by the interruption of the line current through an inductance coil.

March 26, 1932

Clock Combined with Rear-View Mirror

An innovation in automobile equipment is a combined rear-view mirror and automobile clock which has been placed on the market by the Jaeger Watch Co., Inc., of New York. The clock is of a special design, described as the jump-hour type. The illustra-



tion herewith shows one design of the combination, but the form of the mirror can be changed to meet different

Fuel System for Motor Boats

A vapor-tight fuel system for motor-boats, designed to eliminate danger of explosion therein, has been placed on the market by the Bendix Stromberg Carburetor Co. of South Bend, Ind.

All parts of the system are sealed to prevent gasoline or vapor leakage, and the leakproof carburetor of new design receives its air from outside

requirements of tastes, provided, of course, the order is large enough.

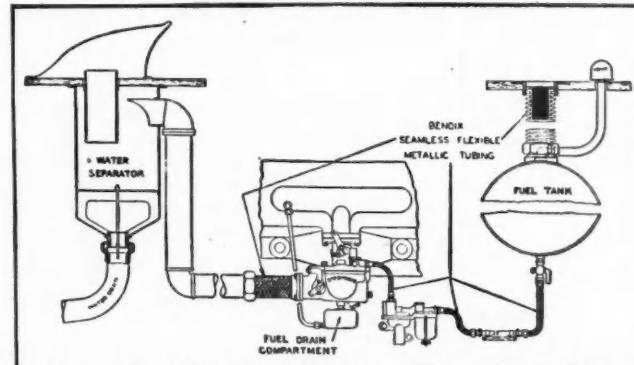
The size of the mirror is larger than that of mirrors usually carried at the top of the windshield, which is said to make adjustments unnecessary every time a person of somewhat different height occupies the driver's seat.

The clock is of the eight-day type and tells at a glance the exact time in hours and minutes. Referring to the illustration, the hour dial shows 8 o'clock, while the minute dial shows 30 minutes, hence it is 8:30. When the minute dial comes to 60, the hour dial jumps to the next hour, hence the term "jump hour." The dials showing through openings in the mirror, they can be easily read by both the driver and the front seat passenger. Indirect lighting is provided, and pressure on a button immediately illuminates the dials.

New Oxfeld Welding Heads

A series of welding heads with detachable tips has been introduced by The Linde Air Products Co., New York, N. Y., for use with the Oxfeld Type W-17 Welding Blowpipe. These will supplement the one-piece style heads for this blowpipe, so that the user will have a choice of two types of welding heads.

through a pipe connecting through a water separator to a ventilator or clamshell in the deck of the boat. The water separator prevents the entrance of water into the carburetor through its air intake. This separator is fitted with a float at its bottom which permits water to drain into the bilge or outboard, yet prevents bad air or gas from the bilge from entering the air intake pipe of the carburetor.



rather than from the interior of the boat. The carburetor is provided with a fuel-drain compartment into which all gasoline drains when the carburetor becomes flooded. Gasoline so drained is sucked into the intake manifold of the engine, where it cannot become a fire hazard.

Air for the carburetor is taken in

Bendix seamless flexible metallic tubing plays an important part in the system. Leaks in motor boat fuel systems frequently result from cracks in the gasoline line caused by vibration, and to guard against trouble from this cause flexible tubing is used at all vital points, as shown in the accompanying diagram.

Automotive Industries